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*Sanskrit in the University**

A PROFESSOR of Sanskrit delivering his inaugural lecture in a modern university may well be pardoned if he feels somewhat like the keeper of an antique-shop trying to advertize his old-world wares! The idea is sometimes entertained, explicitly or implicitly, that the study of the past and the so-called 'dead' languages, particularly those of the Orient, should have no place in the new scheme of things; that only livelier subjects like law and medicine, economics and statistics and the various sciences are the only forms of knowledge worth acquiring, for they could be readily turned to practical account in life. I do not wish to go into the deeper philosophical issues involved in such an attitude nor enter upon an analysis of the ethical situation that springs from such a sense of values. The problem of the present-day significance of the *humanities* has received ample treatment at the hands of more competent authorities than myself.[1] I would rather take my stand on the conviction that the University of Ceylon is sufficiently satisfied of the value of Sanskrit studies to have established a Chair of Sanskrit in the first few years of its existence.

There are a few considerations, however, which I would urge before I deal with the subject proper. The contention that the ancient languages and literatures have no meaning for us rests on a fallacy born of a too revolutionary view of human progress. If civilization is what it is today, it is largely, if not solely, due to what it was yesterday and the day before. Every step in human progress has been made possible only on account of the social tradition handed down by past generations and this tradition, of which language is perhaps the most important element, lives even today in each of us. As a leading anthropologist says 'The culture that exists at any given time and place has come from the past. It is the result of accumulation of things, attitudes, ideas, knowledge, error, prejudice . . . From this angle, the major role of language

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1. See *Synthesis in Education*—Addresses given at the Summer Conference organized by the Institute of Sociology at Newnham College, Cambridge, August, 1944: edited by Miss D. M. E. Dymes, M.A.

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is that of a culture-carrier . . . Next to the prolonged infancy of man, the culture-bearing function of language is the most important fact in the making of humanity'.[2] The past is never *dead*, in the sense of being annihilated, it continues to live in its products. There is a true sense in which Sanskrit, like classical Latin and Greek and other tongues no longer spoken by whole communities, never died. They were in course of time transformed by the processes of linguistic change, and the modern dialects derived from them are the *living continuation* of these dead languages. In the same sense as Latin is considered[3] to survive in its derivative languages and dialects such as Spanish, Portuguese, French, Italian, so Sanskrit can be said to live today in its derivatives such as Bengali, Hindi, Marathi, Gujarati, Sinhalese and a host of other dialects. In a different way it may be held that Sanskrit survives also in the Brahmin schools of Vedic learning, in the various institutions of Pandits and Sastries, such as the Navadvīpa school of logicians in Bengal, and also in the technical subjects and professions like medicine and music, just as Latin has been declared to survive in the Catholic Church and in the various church libraries and schools.

Apart from these purely linguistic considerations, the civilization of which Sanskrit has been the main vehicle permeates the life of nearly everyone in a large part of Asia today, including the Sinhalese and Tamils of Ceylon. I may add that the comparatively lower estimate of Oriental literatures and the civilizations they represent that has been the fashion of several writers in the past, is hardly possible today in view of the importance of scientific discoveries in the ancient cultures of the East in general and of India in particular, and the more accurate knowledge we have now of prehistoric and ancient cultural contacts between the East and the West. I shall have occasion in the course of this discussion to offer you a few facts to support this statement.

As my immediate duty, however, I am going to ask your patience while I attempt to give you a brief description of the modern significance of Sanskrit studies, or as the Germans are (or rather, were !) accustomed to call it, of *Indology*. Although the term 'Indology' may not seem so apt when used in a University like that of ours where the study of the literatures and civilizations contained in other Indian languages like Pali have separate Chairs, yet it does seem relevant in so far as a teacher of Sanskrit in a modern University must concern himself not only with the Sanskrit language, its literature and philosophy, but also with the rise and growth of the civilization that is reflected in it. It is only then that the concept of Sanskrit as one of the *humanities* comes to be fully justified. With this in view, I shall first deal with the methods of teaching and research, as I humbly believe should prevail in the

2. Goldenweiser, *Anthropology* (New York, 1946), p. 41.

3. Highet, *The Classical Tradition* (Oxford, 1949), pp. 6-8.

Sanskrit department of a modern university, and then endeavour to offer you an analysis, however brief, of the *motives* of such scholarship.

It is no secret that even in Ceylon there is at present considerable confusion, although not so patent as in India, as regards the correct method of approach to the study of Sanskrit. On the one hand, those of the 'old school' would have even the university propagate the traditional and conventional methods of teaching and studying Sanskrit as followed by the Pandits and the Sastries. On the other hand, we have the modern students of Sanskrit who, having received their training in the universities of the West or under teachers trained there, have developed a 'scientific' attitude towards their subject. They have regard for what Prof. Radhakrishnan has so aptly called 'the University spirit of self-criticism and broad-minded reasonableness'.[4] The university student, even of the arts or humanities, has today to conform to that self-same principle of self-elimination in his judgements which Prof. Karl Pearson in his *Grammar of Science* recommends to the pure scientist. There can be no blind acceptance of ideas, however hallowed by tradition or surrounded by the halo of antiquity. While he must respect the true achievements of the past, the University student must ever be ready to reject whatever does not stand the test of rational and intelligent scrutiny. In short, he must develop the spirit of objectivity, or the scientific attitude.

No less shrewd a judge of the contemporary situation in India, the home of orthodox Sanskrit scholarship, than Prof. Radhakrishnan, himself a proud admirer of things Indian, is compelled to exclaim: 'I am afraid that the Sastries and the Pandits, the Moulvies and the Moulanas . . . of the conventional type are not likely to be of much help to us in our present condition'.[5] In spite of this, however, attempts are made[6] even today to emphasize the need of adhering to the older and traditional methods of learning and teaching Sanskrit, as it is claimed that since there is much that is logical and intelligent in those methods we should somehow adopt them in the University. The immediate problem, so far as I see it, in relation to the University, does not so much pertain to the correctness or otherwise of this claim, but simply to the appropriateness of having recourse to those ancient methods *in the modern social context*. It is well known, for instance, that to gain sufficient mastery of Sanskrit grammar, according to the older aphoristic or *sūtra* method, to be able to make any practical use of such knowledge, it usually involves far more time and labour than is possible for a university undergraduate to devote. And, even if he were to gain such mastery, it is extremely doubtful whether he will be able to tackle his subject in the critical and historical manner required by university studies. The Pandit's microscopic knowledge of grammar often

4. *Freedom and Culture* (Madras, 1936), p. 2.
5. *Loc. cit.*
6. Huparikar, G. S., *The Problem of Sanskrit Teaching* (Kolhapur, 1949).

becomes an ideal by itself, and, whatever advantages it may have, it certainly imposes severe restrictions on his appreciation and interpretation of the literature. The University cannot resign itself to such drastic limitation of outlook which is the defect of the virtue of the microscopic, intensive study of a sacred book or classic. It is the function of the university to broaden the mental vision of its students, but not to confine it to any one particular groove. The comparative philological approach to the Sanskrit language has met with such outstanding success at the hands of western scholars that it is hardly necessary to dilate upon it. The grammatical works of Whitney and Macdonell, Wackernagel and Renou amply demonstrate the superiority of the modern method, although, I hasten to add, these experts themselves have always been ready not only to acknowledge the great scientific value of Pāṇini's ideas but also their own indebtedness to some of them. It seems singularly appropriate in this connexion to adapt the words recently used by Mr. Nehru in a slightly different context : the achievements of ancient Indian grammatical science are patent to everybody as also the fact of its having become stagnant. To follow Pāṇini and do nothing else to develop Sanskrit grammatical knowledge would be most unprogressive.

As for the other branches of Sanskrit learning, the value of the modern critical, comparative and historical approach is far greater and obviously it is the only logical course for a university to follow under modern conditions. The Sanskritist who wishes to understand the Ṛgveda, or, for a matter of that, any Vedic text, without the aid of the modern sciences of comparative philology, comparative religion and mythology, archaeology and anthropology, is indeed attempting a hopeless task. This does not mean that the indigenous tradition with its commentaries and glossaries is useless and is to be completely ignored. The University must and will use all available avenues for the acquisition of knowledge and the progress of research. For an illustration, I may refer you to the story of the Great Flood as found in a Vedic text, the *Śatapatha Brāhmaṇa* (1. 8. 1) where it is related how Manu, the primeval progenitor of the human race, was saved from the great Deluge by a fish with the help of a ship and how the human race came to be renewed through him, the sole survivor. The university scholar who attempts to understand this legend will not only refer to the Indian exegetical tradition and the other versions of it as found in the *Mahābhārata* and the *Purāṇas*, but as a student of comparative mythology and folklore he will soon come to recognize this same legend in the various Flood stories of other nations and cultures. For, anyone who reads the Huxley Lecture[7] delivered by Sir J. G. Frazer in 1916 can hardly fail to see that the roots of this Brāhmaṇa legend are far more widespread than may be implied by the extant Indian tradition. In fact, it

7. Enlarged and republished in his *Folk-lore in the Old Testament*, Vol. I, pp. 104, *et. seq.*

is only the wider view thus provided by modern research that can make this legend at all intelligible. And so it is, I may add, with the whole field of Vedic antiquities. Those who resort to the self-contained technique of explaining this ancient literature on the sole basis of the indigenous tradition are apt to find themselves involved in the web of their own speculation. A modern university guided by a spirit of criticism and broadmindedness can ill-afford to spend its time in such pursuits.

So far I have spoken about the advantages that the Sanskritist may derive by paying due attention to the comparative, critical and historical methods of modern scholarship. It is now time to take up the more important part of my thesis, and to discuss the place of Sanskrit studies in the academic scheme of a modern university. Why should Sanskrit be taught at all? And, why should so much time and labour be devoted to research into the various aspects and phases of that language and civilization? These questions necessitate an analysis, however incomplete, of the motives of Sanskrit scholarship as pertinent to the modern University.

I do not consider it so necessary in this lecture to emphasize to you the great cultural and aesthetic value of Sanskrit literature. Every student of world literature is acquainted with the works of Kālidāsa, and, however great this dramatist-poet was, he was certainly not a lone star in the firmament of Sanskrit literature. Other equally great names are abundant although their possessors did not have that all-round excellence generally attributed to the master. 'In the great writers of Sanskrit *kāvya*, headed by Kālidāsa', writes Prof. Berriedale Keith, 'we find depth of feeling for life and nature matched with perfection of expression and rhythm'.[8] Nor does this mean that Sanskrit poetical literature only begins with Kālidāsa. The great epic, *Rāmāyaṇa*, which preceded Kālidāsa by several centuries, has been hailed by competent literary critics as 'a conscious work of art'.[9] In gnomic poetry too the Sanskrit writers 'attained a mastery which has never been gained by any other nation'.[10] This classical Sanskrit literature dates from about the beginning of the Christian era, as the remarkable discovery of Aśvaghoṣa's poems and dramas showed. It is dominated not only by aesthetic aim but by a complex aesthetic theory as well. This literary aesthetic is popularly held to be the cause of the 'artificiality' of later poets, leading to an erroneous comparison of Sanskrit poetry with the Alexandrine literature of Greece, although it must be understood that it developed in intimate relation to the Indians' mode of life and their dominant philosophical tendencies. But, even this technical movement, as the late Prof. F. W. Thomas insisted, is not

8. *A History of Sanskrit Literature* (Preface, 1928), p. vii.

9. *Ancient India and Indian Civilization*, edited by Masson-Oursel, p. 226.

10. Winternitz, *A History of Indian Literature*, p. 2.

to be underrated. In the best of the classical poets such as Bhāravi and Kālidāsa even such convention could 'evoke a strong aesthetic response'.[11] The Indians' cultivation and the appreciation of beauty—taste, *rasa*—was conscious and deliberate, and led to their elaboration of a remarkable aesthetic theory, whose psychological value is only now beginning to be appreciated in the West.[12] I do not wish to dilate any further upon the high aesthetic value of this literary legacy, as it will be readily conceded that the teaching of such a rich and varied literature must immeasurably add to the cultural content of any university education. For, it is my main intention in this lecture to draw your attention more to the *scientific* value of the ancient literary documents found in Sanskrit. This is an aspect which needs particularly to be stressed in the present context inasmuch as it has not been sufficiently appreciated in its important bearing on the problem of the modern concept of *synthesis* in university education and its professed ideal of *humanism*.

By the term 'scientific value' as used here one may understand the historical significance of the data afforded by the vast Sanskrit literature, for example, to the linguistic and the anthropological sciences, or, one may mean by it the direct scientific value of whatever conclusions the ancient thinkers and scientists of India had reached with regard to the problems of life and the world. The former approach may be said to consider Sanskrit literature as a museum in which the modern student of the Sciences of Man may find valuable material for his studies. 'Whoever likes to labour in these the most ancient of historical archives', says Max Müller with reference to the Ṛgveda, 'will find plenty of discoveries to make—and, yet people ask, what is the use of learning Sanskrit?'[13] It would have given intense satisfaction, if he lived today, to this illustrious pioneer of Sanskrit scholarship to know that every modern student of language, of prehistory and antiquities, of comparative religion and of various other branches of academic learning, has begun to realize the great scientific value of Sanskrit literature.

It is undoubtedly in the Science of Language that the influence of Sanskrit has been most pronounced and universally accepted. I need not dwell at length on the momentous significance that the Western discovery of Sanskrit had for the development of Comparative Philology. It was in his third address before the Royal Asiatic Society of Bengal, on 27th September, 1786, that Sir William Jones made that memorable statement which became the starting point for the modern science of Comparative Philology in Europe. 'The Sanskrit language [he declared], whatever be its antiquity, is of a wonderful

11. *The Legacy of India*, edited by G. T. Garratt, p. 196.

12. Masson-Oursel, *Comparative Philosophy* (The International Library of Psychology, Philosophy and Scientific Method, edited by C. K. Ogden, 1926), p. 191.

13. *India—What Can It Teach Us*, p. 27.

structure; more perfect than the Greek, more copious than the Latin, and more exquisitely refined than either; yet bearing to both of them a stronger affinity, both in the roots of verbs, and in the forms of grammar, than could possibly have been produced by accident; so strong indeed that no philologer could examine them all three without believing them to have sprung from *some common source*, which perhaps no longer exists . . .'[14] This is how a recent writer on linguistics, Dr. Goldberg, characterizes this epoch-making discovery: 'In the history of languages this discovery of Sanskrit is comparable to the discovery of America in the history of the continents. It altered, at one stroke, the whole map of linguistic research'. Previous to this, even such able thinkers like Leibnitz, Trombetti and others in their speculations on the history of language were merely groping in the dark. 'This groping, however informed and intelligent', adds Dr. Goldberg, 'might have continued thus blindly for ages, were it not for the "discovery" of Sanskrit. The sacred language of the Hindus comes upon the scene like a *deus ex machina*, in one of the central moments of all linguistic investigation'.[15] I have neither the time nor the inclination here to follow up the subsequent contributions of Sanskritists like Bopp and Brugmann, Max Müller and Whitney to the advancement of linguistics. It will suffice to observe that Comparative Philology is now recognized by most universities as an aspect of Sanskrit studies and is regarded as one of the academic disciplines. In fact most Chairs of Sanskrit in the world are designated as Professorships of Sanskrit and Comparative Philology. The erroneous impression that its value is only for the study of language, that ethnic and cultural deductions based on linguistic data as attempted in linguistic palaeontology are nearly always deceptive, can now be dismissed as an unduly alarmist preconception. No less a scientific student of culture than Prof. V. Gordon Childe who does not hesitate to accept whatever linguistic palaeontology has to offer in his search for the prehistory of 'the Aryans' says: 'Philology may therefore claim a place among the historical disciplines, the functions of which are to reanimate and interpret the process whereby man has raised himself from animalism to savagery, from savagery to barbarism, from barbarism to civilization'.[16] He has no doubt that common language does imply a common outlook in its speakers and that phonetic changes may indicate an *ethnic* basis. And this 'key to lost civilizations' was certainly furnished by the discovery of Sanskrit.

The scientific data provided by Sanskrit language and literature do not stop with the materials it offers to linguistics. The Vedic literature, going back to the middle of the second millennium before Christ, possesses, in the

14. *Works of Sir William Jones*, edited by Lord Teignmouth, Vol. II, p. 268.
15. *The Wonder of Words* (New York and London, 1938), p. 218.
16. *The Aryans* (History of Civilization Series), pp. 3, 7, 78-79.

words of Prof. Winternitz, who was both Sanskritist and ethnologist, 'absolutely priceless material, which no investigator of Religion can afford to pass by'. Not only for the study of Comparative Religion, but also for the study of comparative mythology and prehistory and the history of civilizations the value of this oldest of Sanskrit texts is nowadays admitted without reserve. 'This priceless document', says Childe, 'also furnishes precious historical data'.[17] Prof. Piggott in his recently published book on *Prehistoric India* admits the great value of the Ṛgveda for the modern archaeologist. This is what he says: 'We shall see that an examination of the material culture of the composers of the *Ṛgveda*, as extracted from the allusions in the text, is entirely compatible with what we know of conditions at this time [i.e. middle of the second millennium B.C.] from archaeological evidence from other regions of early Indo-European colonization around the edges of the old city civilizations in Asia and in the Aegean. I think we are justified in accepting the *Rigveda*, on archaeological grounds, as a genuine document of the period . . .'[18] Till recently archaeologists and historians practically ignored this great document. The archaeological discovery of the Indus Valley (or Harappan) civilization, although hailed as an important step in establishing the Indian as one of the great civilizations of the ancient world rivalling those of Egypt, Mesopotamia and China, presented an enigma to the students of the Ṛgveda, inasmuch as there was the tacit assumption that this Aryan document showed hardly any traces of such an anterior culture in the Punjab Valley. It was only in 1947 that Dr. Mortimer Wheeler, the Director of Archaeology in India, put forward on archaeological grounds his tentative theory of the probable chronological relationship between the two cultures.[19] The yawning gulf that once separated the *Ṛgveda* from the Indus Valley civilization thus appears at last to have been bridged and the two cultures seem chronologically connected—a connexion which, I may add, I was fortunate to have anticipated, however dimly, by a study of different data from these two sources.[20] This hypothesis certainly opens up fresh avenues for investigating the culture of the Ṛgveda and establishes the continuity of Indian civilization for over four or five millennia. The value of all these discoveries for the history of civilization should be patent to all unbiassed students.

It must be emphasized that it is not only in the *Ṛgveda* and the other Vedic texts that data for scientific studies are available. The bulk of Sanskrit literature is not religious in import but secular. The great value of the fable literature of Sanskrit is accepted by all western authorities. In fact fairy-tale

17. *Op. cit.*, p. 30.

18. *Prehistoric India* (Pelican Books A 205), p. 256.

19. *Ancient India* (Bulletin of the Archaeological Survey of India), No. 3, pp. 78-83.

20. *Dr. C. Kunhan Raja Presentation Volume* (Madras, 1946), pp. 429, *et. seq.*

research became an independent branch of knowledge only through Benfey's fundamental work on the famous Indian book of fables, the *Pañcatantra*. The sociological value of the encyclopaedic contents of the two Great Epics of India, the *Mahābhārata* and the *Rāmāyaṇa*, is clearly seen from the researches of E. W. Hopkins, J. J. Meyer and others.

The study of the vast amount of data presented by this immense literature has been the main task of Indology since the first Chair of Sanskrit in the world was established at Paris at the beginning of the last century. It did not take long to realize that this priceless material was a veritable boon to the students of the 'Sciences of Man', among which, according to Joseph McCabe, the majority of present-day sciences are to be counted, such as psychology, archaeology (as the Science of Prehistoric Man), anthropology, ethnology, philology, ethics, aesthetics, comparative religion, sociology and economics.[21] For such studies as these, the 'discovery' of Sanskrit by European erudition opened up a vast field of investigation and Indology became, in the words of Prof. Louis Renou of Paris, 'a veritable science, more fertile and richer on the human plane than the other fields of research in connection with Egypt, Assyria or China'. 'The great works of Indology', he continues, 'are models of science, even if the results have been rendered uncertain in some cases by further progress in research. Human science counts no greater names than those of Burnouf or Bergaigne in France, Colebrooke or Wilson in England, Lassen, Benfey, Weber, Max Müller in Germany, to mention only the pioneers'.[22]

The emphasis I have here placed on the value of the raw facts contained in Sanskrit literature for the investigations of scientific students should in no way be taken as indicating that this great literature is only a museum or a collection of antiquated specimens. The actual contributions of Indians to the development of scientific thought among the nations of antiquity are only now beginning to be appreciated. I have already referred to the untenable view of some critics of Indian civilization that the ancient Indians were only a set of dreamy philosophers. 'It would be utterly misleading', says Prof. Berriedale Keith, 'to picture India as a land of philosophers, of men of thought, not of action. India did not, as Mathew Arnold's poetic vision held, bow deep before the onslaught of Alexander the Great. It desperately resisted it . . .'[23] Similarly, Prof. W. E. Hocking of Harvard ridicules the idea that it is only the West that has been 'realistic' and that the East has ever slumbered in an 'unreal' world.[24] Every student of Sanskrit now knows that there was

21. *Encyclopaedia of Modern Knowledge* (ed. J. Hammerton), p. 2108.

22. *The Future Role of Sanskrit* (Article in The Adyar Library Pamphlet Series, No. 17), p. 21.

23. *Encyclopaedia of Modern Knowledge*, p. 1797.

24. *Philosophy East and West* (ed. C. A. Moore, Princeton University, 1946), p. 4.

in ancient India a large amount of literature dealing with the practical affairs of life, with technical arts and crafts, and with specific sciences. Much of this has been lost ; a large part of what has been preserved is still unedited ; and most of the edited texts have not been studied critically. The available texts show not only an abundant literature on politics and economics, law and medicine, astronomy and mathematics but also on music and dancing, dramatic art and poetics including literary criticism, erotics, architecture, sculpture and other subjects. All these subjects were arranged in scientific systems, and treated in special manuals of instruction. It was an exaggerated idea of the part played by religion and philosophy in the life of ancient India that led to this neglect of Indian *Realien*, as so pointedly stated by Prof. W. E. Clark.[25]

I have previously referred to the scientific value of India's great work on grammar, the *Aṣṭādhyāya* of Pāṇini. This grammar, which dates from somewhere round 350 to 250 B.C. has been called by Prof. L. Bloomfield ' one of the greatest monuments of human intelligence '. ' This Indian grammar ', says this famous authority on linguistics, ' presented to European eyes, for the first time, a complete and accurate description of a language, based not upon theory but upon observation '.[26] There is evidence that the scientific analysis on speech-sounds had been undertaken even before the time of Pāṇini.[27] The Upaniṣads about the eighth century B.C. show a remarkable classification of phonetic elements and there are Vedic manuals or Vedāṅgas on *śikṣā* or pronounciation. These achievements of Indian grammarians and phoneticians stand out in clear perspective when we remember that until the late eighteenth century Europe was, in the words of a recent western writer, ' in the position of the polyglot, who knew many tongues but was still in any deeper sense, linguistically ignorant '.[28] Prof. Clark is therefore justified in saying ' that the study of language in India was much more objective and scientific than in Greece or Rome. The interest was in empirical investigation of language rather than in philosophical theories about it . . . Indian study of language was as objective as the dissection of the body by an anatomist '.[29] It is now well recognized that lexicography too attained a high age in India, but it is not so well known that the ancient Indian lexicographer's methods of semantic analysis have been a source of inspiration even to Dr. Roget, the celebrated author of the first *Thesaurus of English Words and Phrases*. In his Introduction to that work he refers (pp. xxiii-xxiv) enthusiastically to

25. *The Legacy of India* (ed. Garratt), p. 335.
26. *Language* (London, 1935), p. 11.
27. Max Müller, *Lectures on the Origin and Growth of Religion*, p. 146.
28. Goldberg, *op. cit.*, p. 217.
29. *Legacy of India*, pp. 339-340.

the famous vocabulary of the Sanskrit language, the *Amara-Koṣa* as translated by Colebrooke, which he regards as at least 900 years old. Referring to the section of that work relating to natural objects classified into separate classes, Dr. Roget remarks that it exhibits 'a remarkable effort at analysis at so remote a period of Indian literature'.[30]

For another illustration of the achievements of ancient India in positive scientific thought let me refer you to a discovery in mathematics, which modern research has definitely shown to be the work of the Hindus. I mean the conception of the zero and its symbol and of numerical notation. Prof. Whitehead the mathematical philosopher referring to the fact that the Roman notation for numbers had no symbol for zero regarded it as having developed among the Arabs in connection with their notation for numbers.[31] But it is now generally conceded that the Arabs got this knowledge from India along with their use of the numerals with place value. Even the late Prof. Berriedale Keith who was at first most reluctant to accord originality in these matters to the Indians was compelled to admit in 1928 that 'the use of *śūnya* (zero) in the *Chandassūtra* of Piṅgala must be accorded due weight and the Indian hypothesis has gained strength from the new investigations accorded to it'.[32] This *Vedāṅga* text on metrics was composed at least two centuries before Christ and even Keith calls it 'a work of considerable age'.[33] Since then much more historical research has been done, and in 1937 Prof. W. E. Clark in what may be regarded as the latest and the most authentic pronouncement on the subject reaffirmed his original opinion that both the zero and its symbol along with the method of reckoning by means of nine signs and zero must be considered as Indian inventions. He successfully disposes of every argument to the contrary brought forward by Kaye and others and shows that the inscriptional evidence in India and Indo-China (which obviously borrowed these ideas from India), coupled with the data from Sanskrit and Arabic literary sources, demonstrates that the use of the nine numerals and zero with place value is purely an Indian invention, anticipating their use by the Arabs by several centuries.[34] He further goes on to show that the Arabs borrowed the greater portion of their mathematical knowledge also from India. This is important for the history of modern western mathematics as Europe has always admitted their indebtedness to the Arabs in these respects. A well-known authority on Arabic civilization Prof. S. Lane Poole says, 'In mathematics especially the Arabic masters made an invaluable advance by employing the

30. *Thesaurus of English Words and Phrases* (London, 1857), p. xxiv (f.n.). I am indebted to my colleague Mr. Julius de Lanerolle for this reference.

31. *Introduction to Mathematics* (Home University Library), pp. 62-63.

32. Preface to his *History of Sanskrit Literature*, p. xxiv, (1928).

33. *Ibid.*, pp. 48, 416 (f.n. 3).

34. *The Legacy of India*, pp. 357 *et. seq.*

Indian ciphers for notation . . .'[35] The great value of India's contribution to mathematics is now admitted even by leading western scientists. This is what Prof. L. Hogben, F.R.S., writes: 'The Hindu numerals were devised by people who had already used the abacus and adapted them accordingly with a dot or circle for the emptied column. Their word for zero "sunya" means empty . . . The intellectual revolution which is signalized by the "Lilavati" of Aryabhata, a Hindu mathematician who flourished about 400 A.D., was made possible by an invention which was no product of mathematical sophistication. It had its roots in the common social heritage. Hindu number-lore was assimilated by the Arab conquerors of the East and the great Moslem eruption transmitted the fruits of the discovery to the western world'.[36]

It may be added that with the discovery of the Indus Valley civilization of the Punjab the antiquity of the Hindu social heritage has been taken back by a thousand or more years. Says Prof. V. G. Childe, 'The decorative art of the Indus cities, with its compass-drawn circles, circumscribing triangles, and squares, would illustrate "geometrical propositions" by 2,500 B.C. Two thousand years later Sanskrit ritual manuals bear witness to extensive applications of geometry. In the interval it is quite possible that India was contributing to the development of Babylonian mathematics . . .'[37] This last remark assumes special significance when it is considered that writers on Greek science trace its origins in antiquity mainly to Babylonia.[38]

It is not only in the fields of grammar and mathematics that Sanskrit literature reflects valuable scientific conceptions. In a more technical subject, the theory of music, Sanskrit texts contain a wealth of scientific information. I shall only refer you to the important researches into the theory of Indian music that have been done in the last quarter century by such authorities as Clements, Fox Strangways, Galpin, Bake and Daniélou. The last mentioned writer remarks: 'The Hindu classification [of musical sounds] deals once and for all with the subject of musical relations. It is the necessary basis of any serious study. All other classifications are beside it child's play'.[39] Commenting on the existence of a scientific notion of the scale already in the *Ṛkprātiśākhya* (13. 17) datable at the latest fourth century B.C., Fox Strangways says: 'The Indian scale, then, existed in principle twenty-four centuries ago, and that principle included, as we have seen, the recognition of a major third as a consonance. Of that recognition we have no documentary evidence in

35. *Encyclopaedia of Modern Knowledge*, p. 643.

36. *Ibid.*, p. 1459; cp. V. G. Childe, *Man Makes Himself*, p. 225; B. Farrington, *Science in Antiquity*, p. 23.

37. *Man Makes Himself* (TL. revised, ed. 1941), p. 225.

38. See, for instance, Farrington, *Science in Antiquity*, pp. 10 *et. seq.*

39. Alain Daniélou, *Introduction to the Study of Musical Scales* (India Society, 1943), p. 99.

Europe till a treatise by Ptolemy in the second century A.D. But this Indian treatise is quite different. Not only is it contemporary, but it offers this same major third not as a theoretical solution but as a substantive element of a scale already in being. That opens a vista '.[40] In the Vedic *Vedāṅga* on metrics, the *Chandassūtra* of Piṅgala, already referred to, dating several centuries before Christ, the seven notes of the octave (*grāma*) are referred to by the seven initial syllables of the Sanskrit names of the notes, *sa, ri, ga, ma, pa, dha, ni*. This device is typical, as has been observed, of the Indian *sūtra* style. The same method of naming notes but with differences in particular names, is found in Persia. Was it borrowed by the Arabs from Persia and transmitted to Europe? asks Prof. Clark,[41] for, as Lévi argued before him, the syllables of the *solfeggio*, demonstrably neither Greek nor Latin nor Arabic, shows a strong resemblance to the Indian *sarigam*.[42] These considerations should be sufficient to invite the attention of students of the origin and development of musical theory to the great field of study awaiting them in Sanskrit literature.

The time at my disposal is not adequate to deal at length with other sections of Sanskrit technical literature and the scientific ideas they contain. I shall content myself with a passing reference to India's contribution to medicine. It is recognized that Sanskrit literature possesses voluminous ancient texts on medicine such as the works of Caraka and Suśruta. These through their Arabic translations, made about 800 A.D., are known to have considerably influenced the development of western medicine, for Arabian methods of treatment provided the guiding principles for European physicians down to the seventeenth century. Medical practice has a continuity of at least three thousand years in India, for the first glimpses of the attempts of physicians to use herbs and other materials for the curing of disease goes back to the *Atharva Veda* and may even antedate it, if the indications from the Indus Valley finds are given their due weight. That at such a remote period as 2,500 B.C. the Indians thought of sanitation and hygienic town-planning[43] seems incredible but for the certainty of archaeological discoveries. Further, we know that surgery and anatomy were considerably developed by the sixth century B.C. and it appears that by that time there was also specialism in the various branches of medicine such as paediatrics.[44] I may refer you for further evidence to the recently published work on *Hindu Medicine* by Prof. H. Zimmer. It is certainly significant that the Johns Hopkins Institute of the History of Medicine thought this subject sufficiently important in 1940 to

40. *Legacy of India*, pp. 313-314.

41. *Ibid.*, p. 357.

42. Lévi, *La Grande Encyclopedie*, xx, p. 710, cited by Clark, *op. cit.*

43. Mackay, *Early Indus Civilization*, p. 18 (xii).

44. Cp. *Legacy of India*, pp. 351 *et. seq.*

have invited this eminent German Sanskritist to deliver a course of lectures on Hindu Medicine.[45] It had been the custom, as a competent English medical writer points out,[46] during the past for historians of medicine to trace in approved fashion the development of medicine as a science from Graecian, Cretan or possibly Egyptian origins, through Roman and Alexandrian channels, with a by-pass to Arabian fields of barren culture, and so on again by way of the Renaissance to modern times. Such 'historical' tracing of development avoided any but the most perfunctory allusion to Hindu medicine. I hope I have managed in these few remarks to indicate that such neglect of the data supplied by Hindu medical literature is neither fair nor historically justifiable.

From what I have said so far on the value of the scientific literature in Sanskrit it would appear reasonable to draw the conclusion that there must have been in ancient India a long continued tradition of rational thought and scientific experimentation. This should be important for the history of science in the ancient world. Western writers have so far traced the origin of the impulse to rational and scientific thinking to the Ionian Greek thinker, Thales of Miletus, in the sixth century B.C. He is credited with being 'the Father of Science'[47] chiefly because he was the first in Greece to have broken away from the confused mythicism of previous writers and postulate a physical element, water, as the ultimate cause of everything, thus giving 'a scientific and mechanical explanation'.[48] If so, the credit of being 'the grandfather of science' may well go to the author of the Ṛgveda hymn X, 129, who preceded Thales by a good half millennium, and wrote a hymn celebrating water as the source of the world. Nor does this ancestry seem so illegitimate when it is remembered that Thales derived his inspiration for scientific thought from Babylonia[49] and Babylonia probably owed much to India in respect of science, as historians of civilization point out.[50] In fact, archaeologists like Sir Flinders Petrie clearly have admitted direct Indian influence on Greece[51] and particularly on the Ionian thinkers of Asiatic Greece, who were the most intellectual. That scientific conceptions are throughout independent works

45. Henry R. Zimmer, Ph.D., *Hindu Medicine* (The Johns Hopkins Press, 1948).

46. F. G. Crookshank, M.D., F.R.C.P., in his Introduction to Masson-Oursel's *Comparative Philosophy* (1926), p.10.

47. See Singer, *Encyclopaedia of Modern Knowledge*, p. 1416.

48. See Bevan, *Ibid*, p. 574 ; Farrington, *Science in Antiquity*, p. 40. But Prof. A. Wolf regards this explanation as 'crude', *An Outline of Modern Knowledge*, p. 6.

49. See Farrington, *Science in Antiquity*, Chapters I and II.

50. Childe, *What Happened in History* (Pelican Books, A 108), p. 115 (cp. 114). cp. Hearnshaw, *Outline of Modern Knowledge*, p. 780.

51. *Egypt and Israel*, p. 134 (ed. 1923).

of Greek thought[52] seems, therefore, untenable in the light of modern discoveries. Empirical methods of observation and measurement were employed in India even at the time of the rise of Buddhism, about the sixth century B.C., as seen from an allusion[53] in the earliest of Pali Nikāyas which refers to the physical experiment of weighing an iron ball before and after being heated in order to detect any possible change in its weight. As Prof. Clark points out, a people which was capable of making the Iron Pillar of Delhi [A.D. 400] measuring 23 feet 8 inches, in pure, rustless, malleable metal weighing six tons, giving it a wonderful polish which cannot be duplicated even today, and transporting it over distances of several hundred miles, surely must have had a sufficiently long tradition in physical scientific experiment and technique. V. Ball in his *Economic Geology of India* (p. 338, 1st edn. 1881) remarked: 'It is not many years since the production of such a pillar would have been an impossibility in the largest foundries of the world, and even now there are comparatively few where a similar mass of metal could be turned out'. If, as a recently published work on the Classical Tradition asserts, 'the Greeks were civilized because they *thought*',[54] i.e. engaged in rational speculation, surely then the Hindus by virtue of their positive scientific achievements may also lay claim to that attribute.

In this discussion I have not so far mentioned the extensive philosophical literature that Sanskrit possesses, reflecting various stages in the development of human thought. Both the humanistic importance of such literary treasures as the Upaniṣads and their influence on western thinkers from the time of Schopenhauer are more or less common knowledge. But as their surviving value[55] to the philosophers of the modern world has not been so obvious I consider it necessary to make even a passing reference to the subject. Even at the beginning of this century a western philosopher, Prof. Royce of Harvard University, deemed the philosophy of the Upaniṣads sufficiently important to expound it in his Gifford Lectures before the University of Aberdeen. Since then, due mainly to the efforts of Indologists, the subject has been admitted, though somewhat surreptitiously, into the curricula of most western universities and the agenda of international philosophical conferences. The University of Oxford during the early thirties thought it important to establish the now famous Spalding Chair and invite the greatest living exponent of Indian philosophy to occupy it, though for some obscure reason it was thought necessary to evade the word 'philosophy' in its designation! But the great *spiritual*

52. See Windelband, *A History of Philosophy*, p. 27 (f.n. 1); but contrast Farrington, *Science in Antiquity*, p. 33.

53. Pāyāsi Suttanta (xxiii. § 15), *Dīgha Nikāya*, Vol. II, p. 334.

54. Highet, *The Classical Tradition* (1949), p. 548.

55. See particularly Masson-Oursel, *Comparative Philosophy*, and *Philosophy East and West*, edited by Moore.

value of Indian culture seems to have received sufficient prominence in it, and on this aspect of Indian civilization it remains for me to say a word. There are writers on the Graeco-Roman tradition who insist on its superior 'spirituality' and try to discover even the origins of the *religious spirit* in Greece.[56] It may be of scientific value to students of religion and culture to emphasize that while this attribution of spirituality to Graecian civilization is not shared by writers like Toynbee, who finds 'a spiritual vacuum at the heart of Hellenic culture',[57] not even the most casual student of Indian literature could miss its great spiritual content. Indian religions like Buddhism which in Keith's words 'fertilized the fine flower of Indian culture'[58] have a spiritual tradition of their own too great to be missed by any one.

I hope I have given a fair indication of what importance Sanskrit scholarship conducted on modern lines may have for any university, and what the main motive should be for the teaching and study of Sanskrit. Let me refer you to the recent Bulletin of a western university which, in announcing its programme of courses, says: 'In the contemporary world Indian civilization shares importance with the descendants of the others—the Sino-Japanese civilization, the Western European and American, the Islamic, and the Russian. Like them it is a frame of human thought and activity, defining the character of living in the present and destined to shape its form in the future'.[59] No such institution today would think of instituting a Chair of Sanskrit for such a limited purpose as the mere translation into Sanskrit of the scriptures of a foreign religion, as the founder of the Boden Chair at Oxford envisaged[60] in 1811.

Any student of the history of the languages and the civilizations of the Sinhalese and the Tamils will admit that the roots of all these go back to India, and, in particular, to that civilization preserved in Sanskrit. While it is a praiseworthy effort to try to discover whatever original contributions this land can claim in matters cultural, it would seem unscientific, to say the least, to deny their Indian origins. Investigations into the development of our social institutions and spiritual heritage would, I believe, confirm the idea that not only the Tamils but also the Sinhalese are partakers of that civilization of which Sanskrit has been the principal medium. It belongs to us and we are part of it. Ancient Ceylon seems only to have continued the Sanskrit

56. Highet, *op. cit.*, p. 2 (cp. 548); Edith Hamilton, *The Greek Way*, p. 239.

57. *Civilization on Trial*, p. 84.

58. *Encyclopaedia of Modern Knowledge*, p. 1089.

59. *University of Pennsylvania Bulletin*—South Asia Regional Studies—March 15, 1950, p. 9.

60. See Monier-Williams, *A Sanskrit-English Dictionary*, Preface (1899), p. ix.

tradition, not only in such subjects as grammar and poetics, but also in medicine, astronomy, irrigation-engineering, legal institutions and methods of civil administration. Moreover, I cannot fail to emphasize what should be regarded as another very valid motive for the development of Sanskrit studies in our University. I refer to the fact that the enlightenment that must result from such an academic pursuit will be of immense help to the two majority communities of this island in understanding each other.

In conclusion, I hope I shall not be considered a victim to maximization, if I humbly express the hope that, when the present confusion of values gives way to a truer and more sober perspective, our nascent university will develop a keener appreciation of the legitimate place, in its academic life, of Sanskrit as the 'matrix' from which must ultimately arise our understanding of the evolution of the languages and the social tradition of the large majority of our peoples, which alone can lead to a scientific estimate of their value to Humanity.

O. H. DE A. WIJESEKERA

Some Trends in Mathematical Research[1]

1. Introduction

MY first duty in this Inaugural Address is to pay a tribute to my predecessor in the Chair of Mathematics. Professor Gulaskharam retired after something like thirty-five or forty years' service as a teacher of mathematics at school and university, and I should like to take this opportunity to express the hope that he may enjoy a happy and peaceful retirement.

My second duty is to indicate briefly what I am going to say, and the reason for my rashness in choosing this particular topic, with its forbidding title. Now and then I come across some friend who asks me 'What is all this mathematical research?' Has not mathematics been developed for so long that there can hardly be anything more to add to it?'. This is an interesting question, and I think there are many here who would like to discuss it, to have a rough idea of the way in which the subject has been growing and expanding in recent years, to know what the mathematicians are busying themselves with nowadays.

Mathematics, while it is almost the oldest subject of study in the civilized world, is also the youngest, for new and flourishing branches are ever being born. It is a big problem to keep pace with these developments, there being so many specialised branches that any one person can know only a small fraction of the total knowledge that comes under the term 'mathematics'. If one looks at an examination paper of the Cambridge Mathematical Tripos—Part III, where real specialisation begins, one will notice that in each paper there will be something like twenty-five to thirty questions, and generally speaking a candidate will not understand more than four or five questions, and will be able to answer only one or two. I mention this just to indicate that the tree of mathematics has many branches. It will be appreciated that on an occasion like this I must restrict myself to a few selected topics and trends of their development.

2. Utility and Beauty

There is a general impression that the motive behind what the mathematicians do may be found in the many and varied practical applications to which mathematical knowledge may be directed. Lancelot Hogben, a biologist and a well known populariser of mathematics, says in one of his books

'Without a knowledge of mathematics, the grammar of size and

1. An inaugural address, delivered on 1st February, 1951 at King George's Hall, University of Ceylon, Colombo.

order, we cannot plan the rational society in which there will be leisure for all and poverty for none '.

Admitting that mathematics if properly applied could make great contributions to a planned rational society, it must however be noted that by far the greater portion of what mathematicians would consider as real mathematics has hardly any direct utility of the type that Hogben has in mind. For example, if we consider the notion of number, the knowledge of a school boy who is well conversant with arithmetic may suffice for most practical applications. But a substantial amount of the most elegant and beautiful notions of mathematics have arisen in trying to give a precise logical definition of number, and this knowledge has hardly any direct utilitarian value. The merit of a mathematical piece of work should not be judged by its immediately apparent practical applications. Perhaps it was as a safeguard against the possible overemphasis of practical utility, and the cramping of mathematics that would result therefrom, that Cambridge mathematicians are supposed to have as their toast ' Here is to mathematics, and may it be of no damned use to anybody '. (Excuse bad language, Mr. Chairman, I am quoting from my elders). The late Professor Hardy, the acknowledged leader of British mathematics during the last fifty years, used to delight in the fact that none of his mathematical contributions has ever been or ever likely to be of the slightest practical use—use or misuse, he would add, remembering the misuse of mathematics as of other sciences in the arts of war. His special pleasure was that his work had elegance and beauty, and a permanence that is characteristic of real mathematics, the quality that saved Babylonian mathematics while Babylonian civilization perished, or Greek mathematics while Greek civilization perished. A great mathematician of the last century, Karl Weirstrass, the father of modern analysis, is known to have said :

' A mathematician who is also not something of a poet will never be a complete mathematician '.

Approached in this way, mathematics, and the other sciences too, would appear as genuine branches of *Litterae Humaniores*.

What I have been saying would justify my conviction that when thinking of mathematics in this university, when thinking of the contents of our courses, examinations and equipment, we should bear in mind the practical utility of mathematics, as also the elegance and beauty of abstract pure mathematics. We look forward to a time when students from this university may go out to use their knowledge to the social well being of our people, be it by the applied mathematics of engineering and industry, or by mathematical statistics in matters of social and economic planning, or of astronomy and aerodynamics in the art of weather forecasting. We are hoping in the mathematics department to have eventually at Peradeniya a small mathematical

and statistical laboratory and an Observatory so that the practical side of mathematics may be encouraged. And at the same time, we hope too that there may go out of this university some students, who though not directly using their mathematical knowledge, may find satisfaction in a training which implies thinking accurately and thinking hard, or may have seen a glimpse of the beauty and elegance of mathematical thought, and perhaps have obtained therefrom aesthetic satisfaction and an upliftment of the spirit.

I think I am wandering away from my central theme to which I now revert.

3. Intuition and Proof

When one looks back on the last fifty years of mathematical development, one notices a movement towards more rigour in mathematical thinking, with less reliance on intuition. In the new developments in Analysis due to Hardy and Littlewood, rigour at every step has been the aim. In proving a proposition the assumptions and hypotheses under which the proposition may be made are chosen so that these hypotheses are just and only just sufficient to ensure the truth of the conclusion. That is, with the least amount of assumptions one endeavours to prove the most general consequences. This outlook has led to many interesting theorems, and work along these lines still continues. This kind of Analysis is sometimes spoken of as the 'hard, sharp, narrow' kind as contrasted with the 'soft, vague, broad' kind of some American and German mathematicians.

Ramanujan, the great Indian mathematician with a very exceptional gift of mathematical intuition, had, while remaining isolated, invented certain theorems and identities. When he was discovered by the mathematical world and sent to Cambridge, Professor Hardy tried to get Ramanujan to *prove* some of his results. But Ramanujan's conception of proof was so different from Hardy's! If intuitively Ramanujan was convinced of the truth of the theorem, he was satisfied. But intuition while it helps to lead to these theorems is no alternative to mathematical proof. There are some well known unproved theorems in existence—for example Fermat's last theorem, which people have been trying to prove for the last three hundred years. The theorem asserts that no whole numbers or fractions x, y, z, exist such that $x^n + y^n = z^n$, where n is a whole number greater than 2. The theorem is found to be satisfied by every set of numbers that have been tried so far, but a proof has not been possible. Substantial prizes have been offered for a complete proof, but competent mathematicians say that there must be other easier ways of making money than this one.

It is said that Ramanujan would produce roughly one theorem or a series or an identity each day, and it kept Hardy busy for months trying to prove these rigorously. Out of some hundreds of Ramanujan's results only a few

were eventually found to be incorrect. When asked how he got at these wonderful results, Ramanujan would say that the goddess of Namakkal inspired him with the formulae in his dreams. What a tragedy for mathematics that Ramanujan died when yet in his thirties, and when his mathematical opportunities had hardly begun.

4. Foundations of Mathematics

Another noticeable development has been the revival of interest in the foundations of mathematics, both for the clearing up of apparent paradoxes and difficulties, and from the philosophical point of view. The problem of the consistency of mathematics had been thought of as satisfactorily settled by Weirstrass and Cauchy in the first half of the nineteenth century, but the problem again became acute at the end of the century due to the work of Cantor on infinite numbers and infinite sets. This work cast serious doubts on the foundations of mathematics, bringing to light apparent paradoxes and inconsistencies. These difficulties inspired Whitehead and Russell to a detailed study of mathematical logic which led to their monumental work—the *Principia Mathematica*. This publication showed up the great scope of symbolic reasoning, but there still remain many contraversial questions. A Dutch mathematician named Brouwer has put forward some revolutionary ideas of logic, in some respects departing from traditional Aristotilean logic. For example, he would abandon the ' law of excluded middle ' that a thing either is or is not, as for example, a number is either a prime number or not a prime number. Brouwer and his school have built up a system of logic which has received support as well as criticism, and the final confirmation is yet to come.

5. Generalised Geometries and Algebras

Another exciting development has been the growth of generalised geometries and algebras. The technique of mathematics consists of setting up a body of appropriate axioms from which conclusions and consequences of interest may be deduced. One writer has said :

> ' Mathematicians are like lovers—grant a mathematician the least principle, and he will draw from it a consequence which you must also grant him, and from this consequence another '.

Deductive argumentation is their method. Let us take as an illustration the Euclidean geometry which we learnt at school. The name is misleading because it might suggest that this elaborate system of geometry was developed by one man named Euclid. It was the consolidated statement of work of some hundreds of years. This geometry is built on certain axioms. From the axioms various interesting theorems may be deduced. The axioms themselves cannot be proved, but have to be assumed. For over two thousand

years the truth of these axioms had been taken to be more or less self-evident. But studies on axiomatic formulations have shown that it is possible to build up other consistent systems of geometry, based on axioms slightly different from those of Euclidean geometry. A Russian mathematician, Lobatchewsky, was the first to build up such a geometry, and some years later Reimann invented another. In these two geometries all the axioms of Euclidean geometry are assumed except the one called the parallel postulate which is replaced by an alternative axiom.

Mathematically all these systems of geometry have the same status, though some may be more suited than others for application to the physical world. A question like ' Which of these geometries is the true one ?' or the still larger question such as ' What is truth ?' is beyond the range of the pure mathematician. It is for this reason that the word ' truth ' is gradually fading out of the vocabulary of the mathematician (and perhaps of the physicist too !). They speak only about validity, whether from a particular set of axioms a particular deduction is valid or what are the valid deductions that may be made. This is the type of question the mathematician is concerned to answer.

Just as we have these different kinds of geometries, there have also been invented new systems of algebras. The familiar algebra of ordinary numbers satisfies certain well known axioms or laws. For example, there are the commutative laws

$$a + b = b + a,\ ab = ba\ ;$$

the distributive law

$$a\ (b + c) = ab + ac\ ;$$

the associative laws

$$a + (b + c) = (a + b) + c,\ a\ (bc) = (ab)\ c.$$

There have been invented algebras for which some of these laws need not hold. As illustration, there are these entities called matrices which do not satisfy the commutative law $ab = ba$. In such an algebra if $ab = o$ we cannot infer that either $a = o$ or $b = o$. A great deal of work on these new algebras, and in the allied topic of theory of groups, is being carried on nowadays. The theory of groups is concerned with the study of symmetry. It is said that Egyptian architecture, such as that in the Pyramids, reveals an advanced knowledge of the properties of symmetry, and some writers have suggested that if the Egyptians did not know the theory of groups they were very near knowing it. In recent years group theory has been of great value in the study of atomic architecture—of the way in which the different parts of the atom are arranged, a topic to which I shall refer a little later on.

6. Relativity Theory

Most of these developments I have spoken about have been taken in hand for their mathematical interest, but sometimes some of these have found

unexpected applications in physics. That mathematics would prove a useful tool for discerning the laws of Nature was a firm conviction of the early Greeks. Plato is said to have remarked ' God ever geometrises ', and in the outside of his academy were the words ' Let no man ignorant of geometry enter here '. Pythagoras who invented the mathematical notation of music saw a harmony behind the Universe which could best be expressed in mathematical language. In the fifteenth century Leonardo da Vinci wrote :

> ' There is no certainty where one can neither apply any of the mathematical sciences nor any of those based on the mathematical sciences '.

This was not the sentiment of a narrow specialist extolling his own speciality, but of one who has come down to us as a model of versatility. What was true of science in Leonardo's days is even more so now, in these days of relativistic mechanics and quantum physics.

The relativity theory of gravitation provides a good illustration of the way in which some branch of pure mathematics comes of use in physics. The non-Euclidean geometry developed by Reimann in the nineteenth century was made use of by Einstein for his theory of gravitation. Newton's theory of gravitation, so well known and so eminently successful, had one difficulty right from the beginning, and that is that it uses the notion of action at a distance, a force of a kind that is rather difficult to visualise. When two bodies are touching one another one can understand a force of reaction between them ; or if a string is used to pull a body one can visualise the force of tension in the string. But force at a distance—between say the Earth and the Sun, millions of miles apart, is difficult to believe. Why one introduces the notion of force in such a case is because the path of the Earth as it moves along is observed to bend towards the Sun. Einstein took the step of abandoning this idea of force, and ascribed the bending to the geometric properties of the space round the Sun. When there is a large body like the Sun, its presence distorts the space round it, the space becomes curved, and therefore the Earth moving in the space round the Sun would move according to the geometry of this space. The curvature of this space gives rise to the curved path of the Earth.

To give his theory a mathematical basis, Einstein made use of Reimannian geometry. The Einstein theory and the Newtonian theory give in most cases the same results, to the available degree of approximation, but Einstein predicted a few experimental observations where the difference may be detected. Observations undertaken after the predictions have given the verdict in favour of the Einstein theory. But this Einstein theory of gravitation—the general theory of relativity as it is called—has still many complications in it, and is not a fully accepted scheme, and further work along these lines continues. The special theory relativity, needed for the description of fast moving

systems in electromagnetic fields, is now a fully accepted scheme and is a corner stone in atomic theory. It was this theory that first suggested that a great deal of energy should be obtainable from atomic systems by transforming the energy of matter into other forms of energy.

7. Atomic Physics

Another illustration of the way in which Pure Mathematics unexpectedly comes of use in physics is provided by non-commutative algebra, about which I spoke earlier, and which is now invoked for the mathematical statement of the laws of atomic physics. In the study of matter, first there were studied the properties of substances as we encounter them in ordinary life. And the study proceeds by analysis of these substances when they are divided and sub-divided into smaller entities. Ordinary chemical division gives rise to the atoms as the ultimate units of matter, but physical processes have made possible further division. The chemical atoms have been shown to be really composite systems, composed of a few elementary particles. At first it was thought that there were only two such particles, and that out of them, all substances could be made. These were the electron and the proton. But in recent years there has been an alarming increase in their number. The existence of the neutron, the positron and positive and negative mesons has been well established by experiment, and the existence of a few other particles such as the neutrino has been postulated from various theoretical considerations.

It has been found that classical physics, the physics of Galileo, Newton and Faraday, is not able to describe the behaviour of these particles. For example, the electrons behave sometimes like particles and sometimes like waves, a paradoxical behaviour that could not be reconciled by the classical theory. The need for a new mechanics to describe these small atomic systems arises because such systems cannot be observed with as much detail as large systems. We cannot touch an electron to see its hardness, or look at it to see where it is. Our knowledge about such a particle is much more indirect. To give an illustration, suppose we want to find the position of an electron, we have to look through a microscope. Here a ray of light after reflection by the electron reaches our eye through the microscope. But the light ray on its encounter with the electron would have imparted some of its energy and momentum to the electron, so that the electron has been disturbed by the act of observation. Any further information that we can have will be only of the disturbed electron and not of the original state. The disturbance caused by the act of observation cannot be reduced beyond a certain limit, unlike in the case of large systems. If we want to know where the Moon is, we look at it, if necessary through a telescope. The fact that we are looking at it will not make any difference to the motion of the Moon. But not so with electrons and atoms !

Our approach to the laws of atomic physics has thus to be indirect. One has to take the well established laws of classical physics, and modify or reinterpret them in a way in which they could describe atomic events. The study of these laws is quantum mechanics, and its formulation makes use of non-commutative algebra.

A description of the atomic system is not always possible in terms of pictures or models as classical mechanics would allow, but we have to be content with a mathematical picture. If one is asked the question ' What is an electron ?', one may attempt to describe it by its physical properties and say it is a particle with such a charge, and such a rest mass, and it is a little spinning magnet and so on, but such description is only a partial one. The complete answer that is now available to the question ' What is an electron ?' is the uninspiring answer that it is what is described by the Dirac relativistic quantum mechanical wave equation.

8. Concluding Remarks

In this way one sees that mathematics is becoming increasingly indispensable for scientific description. That is why any attempt to teach science without mathematics is not going to be very successful. J. J. Thomson, a distinguished experimenter, gave that warning some years ago, to the effect that people who are trying to omit the harder mathematical portions in their science teaching will only succeed in teaching that part of science that wont give a headache even to a caterpillar.

I think I have spoken sufficiently at length to indicate, though so inadequately, that there is a great deal of work yet to be done in mathematics, that mathematics did not begin with Pythagoras or Archimedes and will not end with Brouwer or Dirac, that it has utility if that is wanted or beauty and elegance if that is preferred, and that students who have a liking for the subject will find in it, if they take it seriously enough, much scope for their energies and a subject well worth doing.

C. J. ELIEZER

Christian Missions: IX. Some Aspects of Baptist and Wesleyan Work from 1827-1864

(a) The Baptist Mission

THE second period of Christian missionary work in the British Period was one of building on the foundations laid earlier. The Baptist missionary work begun by the Revd. James Chater and continued with the assistance of Hendrick Siers saw very slow expansion due chiefly to the inadequacy both of missionaries and of funds. There was some progress in evangelism in the church in Colombo but the missionary work at Hanwella declined and Hendela was adopted as a new centre of work. Evangelism was also begun in the Kandyan district with centres of work in Kandy, Matale, Gampola and Kadugannawa. In 1843 missionary work was begun at Kurunegala but was given up owing to the unhealthy nature of the place at the time. The total membership of the mission in 1828 was 33 and in 1862 it had only increased to 433 with 64 members of the mission in the Kandyan area[1].

The founder of the Baptist mission, James Chater, left for England owing to ill-health after 17 years of difficult service in Ceylon but he unfortunately died during the journey[2]. After about an year during which the mission was in charge of Hendrick Siers who was helped by the Revd. Benjamin Clough of the Wesleyan mission and some Ceylonese laymen, the Revd. Ebenezer Daniel, sometime minister of Luton who had volunteered to the Baptist Missionary Society in England for service in Ceylon, arrived with his wife and family in 1830[3]. His impressions of the Sinhalese congregation of Grandpass Chapel at that time appears to have been far from happy but he found the English congregation responsive. He spent a considerable time in the study of Sinhalese and began Sunday schools both for Sinhalese and Portuguese children and generally reorganised the work of the mission. His work in the villages was by no means easy. In a letter dated 8th July, 1840

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1. See *University of Ceylon Review*, Vol. VII, No. 3, pp. 202 ff. for earlier period. Annual Report of the Baptist Missionary Society (*BMSR*) 1863, pp. 54-7; p. 83; p. 86; Report of the Colombo Branch, 1858, pp. 7-8; *A Historical Sketch of the Baptist Mission in Ceylon*, p. 28.

2. *B.M.S. Periodical Accounts* (*P.A.*), Vol. 8. Report of 18th June, 1829, p. 17; 19th June, 1828, pp. 17-18; *Missionary Register* (*M.R.*), 1829, pp. 114; 33; 1830, p. 37.

3. *M.R.* 1830, p. 285; 1831, p. 120.

to the Committee of the Baptist Missionary Society in England he writes concerning his work at Hanwella.

> 'People in England may think it an easy thing to go to a Sinhalese village and preach to the people the good tidings of salvation through Jesus Christ. They may be ready to conclude that . . . as soon as the missionary begins to open his commission crowds of willing hearers will flock around him, and receive his message with breathless attention and joy. But although I have no doubt that such times of refreshing will come to this island, they have not yet arrived. The present race of missionaries, especially in the interior, have to sow in tears, and to labour against every discouragement. To collect people to hear the Gospel, and detain their attention long enough to enable them to see its real import, is one of those difficulties which every missionary here has to struggle with. If you wished to collect them together to give them ardent spirits, or to see the cruel diversion of cock-fighting, etc. there would be no lack of attendants . . . But call them to hear of the true God . . . and they will laugh at you; they will ask "what pray will you give us to do so? Give us a quartern of arrack, and we will come and listen to you", or if they are not so coarsely insolent, they will invent some idle excuse, and presently leave you . . . I do not say that all persons who preach the Gospel have to the full extent, these trials to endure. I state the results of my individual experience since I left Colombo'.

In 1833 Daniel's work in the villages suffered by a severe epidemic of small-pox and in 1834 by the occurrence of floods which destroyed the church at Hanwella[4]. His epitaph to be seen today at Cinnamon Gardens Baptist Church was richly deserved.

For nine years after Daniel's arrival the mission continued to have the help of Hendrick Siers. In June 1839, however, after about twenty-five years of service, he died at the age of 55 years[5]. In 1839, the Revd. and Mrs. Joseph Harris augmented the mission to take up work in Colombo allowing Daniel, who was looking after this congregation also, to spend more time in village evangelism. During this time the missionaries began work among Veddah and Rodiya folk on a suggestion made by the then Governor, the Rt. Hon. Sir Stewart Mackenzie[6]. And Daniel started a seminary in Colombo for training young men for the Baptist ministry. After fourteen years of faithful service in Colombo and in the villages Daniel died in June, 1844.

Joseph Harris moved to Kandy in 1841 and developed the mission which had been started in the district by a member of the church in Colombo who had studied under Chater, and had gone to live in Matale in 1835. Another missionary, Charles Dawson, followed Harris and established a Printing Press in Kandy and also started religious work among estate labourers in 1842[7].

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4. *M.R.* 1840, p. 211; *Historical Sketch*, pp. 13-16; 21-23; J. E. Tennent: *Christianity in Ceylon*, pp. 281-2, 290.

5. *M.R.* 1840, p. 64.

6. *M.R.* 1840, pp. 210-11; *Historical Sketch*, p. 19.

7. *Historical Sketch*, pp. 17, 20-31.

A very valuable contribution made by the Baptist missionaries both to the revival of national culture and to the total Christian missionary enterprise was their 'religious' and 'secular' literary work. Daniel not only held office as Treasurer of the Colombo Religious Tract Society, but also published the Tract Society Magazine jointly with the Revd. Benjamin Clough of the Wesleyan Mission. Harris started a bilingual magazine called *The Touchstone* and Dawson another magazine called *The Commentator*. The most outstanding literary work however was done by the Revd. Charles Carter who helped in the translation of the scriptures and also earned a richly deserved reputation as a Sinhalese scholar with several publications to his credit including the well-known Dictionaries and a Sinhalese Grammar.[8]

Despite all these activities the evangelistic work of the mission was seriously hampered by the inadequacy of workers and money. The requests made by Chater and Daniel for more missionaries and greater financial support were repeated many times during this period by those in charge of the mission in Ceylon. In 1859 the Revd. James Allen, a missionary who had arrived in Ceylon in 1846, wrote to the Baptist Missionary Society in England asking for more missionaries :

> 'The work demands it and must languish without it. Is there none to send ? Will no one come ? Have the old fields lost their charms ? Are the new more attractive ? What is it ? In the estimation of everybody we work at immense disadvantage with such a puny European agency. This may be right or wrong but it is plain to me that additional help is needed '[9].

In spite of such appeals comparatively little help was sent from England as the Home Society itself lacked the necessary funds at the time and far from developing the work some of the mission stations in Ceylon had to be abandoned.[10]

But the difficulties that the missionaries had to face were mitigated by the emergence of a Ceylonese ministry and local lay leadership trained in the schools of the mission. By 1850 there were eleven Ceylonese ministers, in 1862 there were nineteen. Among the more noteworthy of these ministers were P. Ranasinghe and James Silva both of whom served in the Grandpass Church and T. Garnier who did missionary work in the Kandyan district.[11]

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8. *B.M.S.P.A.*, Vol. V, p. 141 ; *B.M.S.R.* 1860, p. 16 ; 1863, pp. 15-16 ; *B.M., M.H.* ; December 1, 1859, p. 185 ; September 1, 1860, p. 162 ; October 1, 1860, p. 175 ; May 1, 1861, pp. 72, 73 ; December 2, 1861, p. 188, *Historical Sketch*, pp. 45-9.

9. *B.M., M.H.* August 1, 1859 ; p. 125 ; September 1, 1860, p. 162 ; October 1, 1860, p. 176 ; *C.B.M.S.R.* (Col. Br.), 1858, pp. 10-11.

10. *Historical Sketch*, p. 34.

11. *C.B.M.S.R.* (Col. Br.), 1858, pp. 5-6 ; *B.M., M.H.* March 1, 1859, p. 44 ; December 2, 1861, p. 186 ; *Historical Sketch*, pp. 19-32 ; *Lanka Pradeepaya*, January, 1940, p. 10. J. E. Tennent : *Christianity in Ceylon*, p. 292 ; *B.M.S.R.* 1860, p. 64 ; 1861, p. 60 ; 1863, pp. 55-7.

Another source of help to the mission was the influential English-speaking Baptist congregation in Colombo in which were such well-known members of contemporary Colombo society as Dr. Christopher Elliott who was the Principal Civil Medical Officer, and was considered to be 'a most efficient helper' and 'a devoted leader' of the church; and the members of the Ferguson family who founded the *Observer*. Led by such men this congregation was enabled to support Christian missionary work in other parts of the island.[12]

(b) The Wesleyan Mission (1827-1864)

Unlike the Baptist mission which confined its evangelistic and educational work to the Sinhalese-speaking area, the Wesleyan mission continued the work it had begun in both Sinhalese and Tamil-speaking districts and had a much larger number of mission centres than the Baptists.[13] In the South Ceylon or the Sinhalese-speaking district the chief places in which the mission worked were Colombo, Negombo, Kurunegala, Moratuwa, Panadura, Kalutara, Galle and Ambalangoda; and in the North Ceylon or the Tamil-speaking district the chief centres were Jaffna, Point Pedro, Batticaloa and Trincomalee. The mission also had many sub-stations where there were schools and preaching places. The actual membership of the mission in all these places in 1827 amounted to 439 and there were 73 schools with 3,088 pupils of whom 2,572 were boys and 516 girls.[14] Between 1827 and 1864 when the jubilee of the mission was celebrated its educational work does not appear to have shown any great improvement as far as the number of schools and pupils was concerned but there was certainly a fair response to its evangelistic work.

Among the more noteworthy leaders of the mission during the period were the Revds. Benjamin Clough and D. J. Gogerly who had arrived in the earlier period and the Revds. Peter Percival, Ralph Stott and John Kilner who came to Ceylon during the present period. They were men of scholarship and administrative ability and under their direction evangelistic work in both North and South Ceylon districts expanded. They made a significant contribution to the building up of a Ceylonese Church with a Ceylonese ministry.

Benjamin Clough was Chairman of the South Ceylon district from 1828 to 1838. Besides his considerable literary achievements he was a great preacher and as R. Spence Hardy points out his administration of the mission

12. *B.M.S.R.* 1860, pp. 15-6; 61; *B.M., M.H.*, August 1, 1859, p. 125; September 1, 1859, pp. 134-5, *B.M., M.H.*, December 2, 1861, p. 186.

13. See *University of Ceylon Review*, Vol. VII, No. 4, pp. 269 ff. for earlier period.

14. *M.R.* 1827, p. 105. A subsequent report published in the same report showed a slight increase : 74 schools with 4,113 pupils.

was marked by loyalty and ability, kindness and firmness[15]. Clough was succeeded by D. J. Gogerly who had been sent earlier to the southern circuits to make a special study of Buddhism. During his ministry in Ceylon for forty-four years he never gave up the study of that religion and became an authority on the subject. He had a knowledge of Pali and helped the labours of succeeding evangelists by his researches. For twenty-four out of the forty-four years of service, he administered the South Ceylon district. There is no doubt that he was one of the greatest Christian missionaries that Ceylon has had.[16]

In the North Ceylon district the most outstanding personalities among missionaries during this period were Peter Percival in Jaffna and Ralph Stott in Batticaloa. Percival translated the Bible and also prepared a version of the Church Offices, and was considered a notable Tamil Scholar. He opened the Central School (now Central College), a Girls' Boarding School, several village schools and a Training School. But he and Ralph Stott laid stress on different aspects of missionary method. Percival was strongly in favour of increased educational work as the chief means of conversion while Stott contended that the main duty of a missionary was direct preaching to the people for which he ought to equip himself with a sound knowledge of the vernaculars. On these different concepts of missionary policy Percival and Stott were often in conflict. But the questions involved appear to have been adequately settled so as to give the district the benefit of experiments in techniques based on both concepts of evangelism. There appears to be good reason to think that essentially both these missionaries were agreed on the need for the training of Ceylonese personnel for evangelism in Ceylon. In a report which Percival prepared towards the end of his period in Ceylon he urged that greater attention should be paid to ' the training of missionary agency whether native or European ' and that there was need for ' a greater division of labour, a thoroughly uniform and uninterrupted course of action, and a more diffusive system of evangelical teaching by simple and inexpensive native agency '. John Kilner became Chairman of the North Ceylon district in 1859. When the mission celebrated its Jubilee in 1864 he had been Chairman

15. See *University of Ceylon Review*, Vol. VII, No. 4, p. 276 ff; A. Surgeon: *A Voyage to Ceylon*, p. 18 f; C. Pridham: *A Historical, Political and Statistical Account of Ceylon* (London: Boone, 1849), Vol. I, p. 443; R. S. Hardy: *Jubilee Memorials* (Colombo: 1864), p. 303; G. G. Findlay and W. W. Holdsworth: *The History of the Wesleyan Methodist Missionary Society* (London: Epworth, 1921-4), Vol. V, pp. 68-9.

16. Findlay and Holdsworth, Vol. V, pp. 70-1; 73-4; R. S. Hardy: *Jubilee Memorials*, p. 239; 167-8, 305-306; W. M. Notices: May 24, 1863, pp. 96, 116; October 25, 1862, p. 196; J. Russell: *A Journal of a Tour in Ceylon and India undertaken at the request of the Baptist Missionary Society*, (London: 1852), pp. 13 ff.

for only five years and his best contribution to the work of the mission was to be seen in the period that followed.

• The progress of the work of the Wesleyan mission during the period under review is reflected in the following statistics obtained from contemporary records although how far these statistics are reliable is a moot point :

	1827	1865
No. of Circuits	16	23
Chapels	45	51
Ministers	21	28
Day Schools.. ..	73	104
Day School Teachers	70	131
Day School Pupils ..	3,088	3,515
Full Church Members..	439	1,565[17]

Of the schools in the North under Percival, Lord Torrington, then Governor of the island, remarked : ' Next to that of the American missionaries . . . the success of the pupils at schools under the Wesleyan mission is greater than that of any other religious body in the Colony '. Similar success was seen in the South under Gogerly. R. Spence Hardy stated in his *Jubilee Memorials* that the Wesleyan mission has had schools in almost every important village on the western coast of Ceylon as well as in many parts of the interior although apparently there were doubts as to the wisdom of running so many schools. ' It would have been better if they had sought to cultivate a small portion well rather than so large an area imperfectly '.[18] There is however some difficulty in assessing the exact number of schools. Although the missionary records give the statistics quoted earlier the figures given in government records vary considerably and show 112 schools with 4,316 pupils in 1863 ; 100 schools with 3,501 pupils in 1864 ; and 106 schools with 3,694 pupils in 1865.[19]

The mission press which had been started in the earlier period continued to help both education and evangelism. In 1852 the *Missionary Register* reported that an edition of 2,000 copies of the Old Testament and 5,000 copies of the New Testament was being printed under Gogerly's direction. Periodicals like *The Friend* for the Religious Tract Society and the *Lanka Nidhana* as well as a large number of tracts and other religious and secular publications were printed at this Press[20].

17. *M.R.* 1827, p. 104 ; *W.M.S.R.* 1865, pp. 18, 19, 22, 158-9.

18. pp. 266-7.

19. *C.R.* 1864, p. 118 ; *C.R.* 1865, p. 121 ; *C.R.*, 1866, p. 90, cp. *M.R.* 1827, p. 105 ; *W.M.S.R.* 1865, pp. 158-9 ; and R. S. Hardy op. cit : pp. 261-275. With list of schools on pp. 267-8.

20. *M.R.* 1852, p. 215 ; R. S. Hardy : op. cit. : pp. 275-286 ; 301 ; 331-334 ; J. E. Tennent : op. cit. p. 296.

The Seminary or Mission Academy which had been started by the Wesleyan missionaries for the purpose of training students in Christian work and which had produced school masters, lay-preachers, and catechists was closed down in 1829 but the training of Ceylonese ministers continued under the personal supervision of missionaries. The Wesleyan Mission Notices of May 25, 1861 stated that ' upon the continuance and improvement of a native ministry the chief hope of a country's evangelisation must ever rest '.[21] Among the most successful of the Ceylonese ministers in this period were Samuel Niles, Cornelius Wijesinghe, W. A. Lalmon, D. D. Pereira and Peter Gerard de Zylwa.

The growth of a Ceylonese ministry came at a propitious time for, like the Baptists, the Wesleyans too found that grants from the Parent Society in England were being reduced towards the end of this period. The Society in England sent ' most stringent instructions ' to the Synod of the North Ceylon district for the curtailment of its expenditure and Gogerly too had to limit his work in the South on grounds of economy. Schools' budgets too were reduced and suggestions were made for the deficiencies to be made good by the reduction of the personal allowances to missionaries.

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21. p. 94 ; see also *M.R.* 1828, pp. 120-1 ; 1829, p. 118 ; 1830, p. 39 ; W. M. Notices, May 25, 1861, p. 94 ; 1862, September 25, pp. 165-7 ; 1863, May 25, p. 96 ; June 25, 1864, pp. 127-9 ; R. S. Hardy, pp. 112, 169 ; 172-193 ; 241 ; 306-310 ; 328-330.

A Critical Analysis of the Pāli Sutta Nipāta Illustrating Its Gradual Growth: General Observations and Conclusions

§ 1. IN the series of contributions to the *U.C.R.* concluding with the present article, an attempt has been made at an analysis of the Pāli Sutta Nipāta in the light of Higher Criticism. Various factors of the latter were grouped under the categories of 'criteria' which enabled us to estimate the single suttas as well as groups of them from the angle of literary, doctrinal and linguistic development. Special attention was paid, in the application of these criteria, to view the Sutta Nipāta under the aspect of historical development. Wherever possible, external evidence was adduced in the historical interpretation of the data furnished by internal sources.

A study of methodology was one of the main concerns of this undertaking. Copious examples of each category have been given to illustrate and (as far as possible) prove the propositions; and special attention has been paid to samples of textual interpretation. Exegesis was both synthetic and analytic and the foundation on which it was built is the historical background of Indian (Hindu and Brahmanic) ideas around and prior to the time of Asoka.

By 'growth' is implied the gradual formation of a separate anthology called the Sutta Nipāta by the incorporation of suttas belonging to diverse strata.

For purposes of investigation this work has been divided into four parts. *Part I* (Introductory). The chief criteria (which fall under the heads of linguistic, metrical and literary evidence, doctrinal developments, growth of ideas and external and indirect evidence) employed in the examination of the ballads and other poems of the Sutta Nipāta were discussed in *U.C.R.*, VI, 1. The remarks in *U.C.R.*, VI, 2 are also of an introductory nature, dealing with the title 'Sutta Nipāta' and its form and contents. *Part II.* A brief study of the five Vaggas of the Sutta Nipāta was made in *U.C.R.*, VI, 4. Special attention has been paid to explain the present arrangement of the suttas in their respective vaggas. A few topics of general importance such as the seven 'dhaṃmapaliyāyas' of Asoka's Bhabra Edict, the Chinese version of the Arthapadaṃ (Aṭṭhaka Vagga), the title 'Aṭṭhaka Vagga' and the relation of the vatthugāthā to the pucchās of the Pārāyana were also discussed there. *Part III.* The contributions in *U.C.R.*, VII, 1 to IX, 1 dealt with the analysis of a few suttas representative of the various types of poems of the Sutta Nipāta, with the aid of the criteria detailed in *U.C.R.*, VI, 1. The poems examined were: three ballads from the Uraga Vagga, (Uraga, Khaggavisāṇa and Muni Suttas), five suttas

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of popular character (viz. Parābhava, Vasala, Maṅgala, Metta and Ratana), the Yakkha-ballads (Hemavata, Āḷavaka and Sūciloma Suttas), the Pastoral-ballads, Dhaniya and Kasibhāradvāja Suttas, the narrative-ballads, Pabbajjā, Padhāna and Nālaka Suttas, suttas from the Aṭṭhaka Vagga and the Pucchās of the Pārāyana. Now, *Part IV* is devoted for general observations and conclusions.

The composition of the majority of these poems can be assigned to the period 400-300 B.C. On the evidence available, it is clear that individual suttas have to be taken on their own merits though to some extent particular types of suttas can be vaguely generalised as belonging to distinct strata. The results which this investigation points to fall under the following headings:—(1) an early nucleus of a more or less floating tradition; (2) several intermediate redactions incorporating suttas drawn from the Buddha-legend and Buddha-worship; (3) a final redaction made for the purpose of propagating the Buddhist faith through its ecclesiastic representative, the Saṅgha.

§ 2. In the analysis of the suttas (*loc. cit.*), with the aid of the criteria detailed in *U.C.R.*, VI, 1 a few general tendencies have been observed. Many of the poems, on linguistic grounds, appear to be old; but it is not always that the evidence from other sources is in support of this. Generally speaking the poems of the Aṭṭhaka and Pārāyana Vaggas and many of the pieces of the Uraga Vagga, in addition to those poems which can be termed as the 'Muni-ballads', represent the oldest stratum in the Sutta Nipāta. Before finally enumerating the results which this investigation has led to, a short synthesis of the various data will perhaps be helpful in obtaining a better perspective of the Sutta Nipāta as viewed from the angle of Higher Criticism. This synthesis will be mainly devoted to some aspects of linguistic data; and the characteristics of the later compositions can be inferred thereby. No special attention will be paid to the nominal forms and the few remarks made in isolated instances on the vocabulary are deemed sufficient. Yet, some interesting nominal forms have been touched upon. On the other hand, a study of the verb and the verbal derivatives sheds further light on the Sutta Nipāta as a whole. However, dialectical variations, Vedic characteristics, style and metre will again be touched upon in passing. Sufficient has been said in the individual suttas taken up for analysis on the doctrinal developments; and comparisons with similar poems (in Sn.) and classes of ballads have to some extent shown the general trends in Sn. A short survey will be made of the epithets and other terms used in Sn. to describe the muni and the Buddha.

§ 3. The Sutta Nipāta is rich in verbal forms and shows a very wide range. There are over 2,364 finite verbs in Sn. leaving aside variant readings and p.p.p's. used in a finite sense. Of special interest are the verbs in the Optative and Imperative Moods and the Aorist and Future Tenses.

Optative.—The most favoured inflexion for the opt. in Sn. is -e for 3 sg. In all, about 192 forms end in -e, but as many as 31 of them are either causals or medials (of the 10th class) with the element -ay- (i.e. -aye); e.g. hāraye; ādiye, cintaye, etc. A small number of these optatives in -e belongs to the first and second person singular; e.g. sikkhe Sn. 1061a, 1062d, etc. Next in number come the forms in -eyya. Considering the fact that this is the most popular conjugational element for opt. in Pali, (*vide* Geiger, § 128) it is surprising to note that there are only 135 such forms. Geiger (*ibid.*) does not class these forms as very early, for -eyya is a generalization of the Sk. -eya which underwent universal application in Pali. Of the 135 forms, no less than 115 are 3 sg. Another inflexion used frequently is ā̆ for 3rd sg. (Sk. -āt); 71 times. Its use however, is restricted to a few roots, e.g. √jñā, 33 times, √as, 27 times (assa and siyā), √kṛ (kayirā) 7 times, etc. The opt. 3 sg. in -etha occurs 57 times, and the 2 sg. in -etho only once (Sn. 833c). Opt. 1 sg. in -aṃ occurs 6 times (vijaññaṃ, Sn. 482a, 1020d, 1022e, 1065b, 1090c, 1097d). The first pl. in -mu or -ma occurs 8 times (jānemu, Sn. 76d, 559f, 999ad, jāniyāma 873d, namassemu 995e, sikkhema, 89c and 32b v.l. carema-se). The 3rd pl. in -u or -uṃ (// Sk. -uḥ) occurs 10 times. It is evident that these forms are old. As seen above, some of the forms ending in -uṃ have also the element -eyy- which can be directly traced to Vedic (and Sk.) -ey. Besides those belonging to the type kathayeyya (Sn. 980d) which are accepted as old (Geiger § 139), the majority of the 135 forms in -eyy cannot be classed with the later types enumerated by Geiger (*ibid.*) viz. 1 sg. manteyyaṃ (Sn. p. 103), 2 sg. āroceyyāsi (M. II. 210), dhāreyyāsi (Milp. 47), 3 sg. jāleyya (M. II. 203) and dasseyya (Milp. 47).

Imperative.—The imp. in Sn. can be tabulated as follows:—

2 sg. in -a, 43; in -hi, 110; in -ssu, 23;
2 pl. in -tha, 40; in -vho, 3;
3 sg. in -tu, 16;
3 pl. in -ntu, 6.

All these forms are historical in varying degrees, but are used in all stages of the language, and therefore are of no great value.

Aorist.—Parasmaipada: Following Geiger's classification (Geiger, § 159) 37 verbs can be said to belong to type I (33, aor. 3 sg., 3, aor. 2 sg., 1, aor. 3 pl.), 63 to type II (40, aor. 3 sg., 2, aor. 2 sg., 5, aor. 1 sg., 13, aor. 3 pl., 3, aor. 1 pl.), 90 to type III (72, aor. 3 sg., 5, aor. 2 sg., 3, aor. 1 sg., 10, aor. 3 pl.) and 119 to type IV (67, aor. 3 sg., 5, aor. 2 sg., 7, aor. 1 sg., 38, aor. 3 pl., 2, aor. 1 pl.) which make a total of 309. Ātmanepada: There are 18 A'pada aor. forms. Of them 11 belong to type II (3 sg.), 4 to type II (1 sg.), 2 to type IV (3 sg.) and 1 to type IV (1 pl.)—*vide* Geiger, *ibid.* Among these forms are a few augmentless aorists. Some original pf. forms can still be distinguished,

e.g. āha, vedi, etc. The impf., lost in Pali, is represented by type II and the characteristics of the impf. are preserved in many of them.

Future Tense.—The sign of the future tense conjugation i-ssa- and the terminations -mi, -ma, -si, -tha, -ti, -nti are used in 46 future tense verbs. A form with issāmase occurs once (Sn. 814d). The future 1. sg. -issaṃ occurs 9 times, and -ssaṃ (without the connecting vowel -i-) is used twice with thematic roots (upessaṃ Sn. 29c, and sossaṃ 494c). The other historical forms are :— anupadassati (dā-sya-ti, Sn. 983b), kāhasi (kār-ṣya-si, -ss- ▷ -h- 427d, 428d) gañchisi (*gamᵗsya- i/y, 665d), dakkhiti (drākṣyati, i/y, 909a), dakkhinti (p. 14), pavakkhāmi (-vakṣyāmi, 701c, 963d, 1050b), bhāsihi (bhās-ya- i/y, -analogical- 719a), sakkhinti (cp. dakkhinti 28c) and sagghasi (√śak, 834d). This brings a total of 72 future forms.

§ 4. The verbal derivatives too show an old phase of the language. The Agent Noun, Absolutive, Present Participle, and the Future Passive Participle will be discussed below. The Past Participle Passive will not be touched upon as it yields no definite information. The Infinitives and other forms of Vedic or dialectical origin will also be mentioned.

Agent Noun.—There are 21 agent nouns in Sn. distributed in the following manner in the five vaggas :—8, 1, 6, 4 and 2 respectively.

Absolutive (Gerund).—There are 389 absolutives in the whole of Sn. gāthās. Of them as many as 187 end in -ya, i.e. 111 formed with vowel-ending roots in Pali, in addition to 2 with -āya>-ā (pariññā Sn. 779a, palikhaññā 968b), 66 with consonant-ending roots and assimilation, in addition to 3 with -yy- (pappuyya, Sn. 593b, 829d, 482d) and 7 forms with the svarabhakti vowel (a-r-i). Of these 187 forms, 185 contain prefixes conforming to the Sk. rules. The two forms without prefixes are :—gahāya Sn. 791d, and yāciya 295b. Of the others, there are 117 formed with -tvā, directly from the root. There are 8 forms with -tvā assimilated (labh + tvā > laddhā). There are 26 forms formed directly from the base. Of the 48 forms with -tvāna, 45 are formed directly from the root, two with the base and one form with assimilation (laddhāna Sn. 67c). The form daṭṭhu occurs 3 times (Sn. 424b, 681d, 1098b). Of these 202 as many as 36 forms contain prefixes. It is clear that the majority of these forms go back to a very early stratum in the language.

Present Participle.—In all, there are 350 present participial forms. Of them as many as 139 are medial (107 contain the suffix māna and 32 -āna, both of which are highly archaic and go back to Vedic dialects). The occasional pronominal terminations of ppr. forms with -māna (e.g. Sn. 434a, and mānassa, 7 times) do not indicate that they were late, for in early Sk. too -smin and -sya are the terminations for the sg. of loc. and gen. respectively for ppr. medials in -māna. Of the rest of the 211 ppr. forms as many as 191 are historical. The total lack of forms like gacchantassa and gacchantaṃ and the

exclusive use of forms like gacchato and gacchataṃ for the gen. sg. and pl. respectively show that the ppr. too represents an old stage of the language. The 20 forms which cannot be considered equally old consist of 17 nom. singulars in -anto and 3 loc. singulars in -ante. But in Pali these endings came to be fixed for their respective cases rather early. Though they are not pure historical forms they may be old. The nom. sg. in -aṃ occurs 83 times as contrasted with that in -anto, 17 times. The nom. sg. -āno occurs 21 times (passives included) while that in -māno (passives included) occurs 67 times. The nom. sg. neut. -antaṃ occurs once (Sn. 208b jāyantaṃ). The nom. pl. in -antā occurs 13 times, in -mānā 12 times, and in -ānā 9 times. The gen. sg. in -ato occurs 44 times as contrasted with that in -antassa *nil* and in -mānassa 7 times. The gen. pl. -ataṃ is to be met with 20 times (tāṃ once, *metri causa*, Sn. 763d), as contrasted with -antānaṃ *nil*, and -mānānaṃ only once (Sn. 569c). The acc. sg. in -antaṃ occurs 24 times (including passives and one instance of the final nasal omitted *metri causa* -Sn. 689c) as against the acc. sg. in -mānaṃ 12 times and that in -ānaṃ twice (Sn. 789d, 802c). The acc. pl. in -ante is to be seen three times, that in -māne twice and neut. -mānāni once. The inst. sg. in -tā occurs twice (asatā Sn. 861b, 950c) and that in -tyā (fem.) once (santyā Sn. 872c). The loc. sg. in -ante and -māne occur three times each and in mānamhi once (Sn. 434a). The loc. pl. -mānesu is seen only once (Sn. 434c).

Future Passive Participle.—There are 63 f.p.p. forms in Sn.; of them 46 are formed with -ya (17 assimilated forms), 6 from -tabba and 11 from -anīya. A noteworthy feature is that 46 out of a total of 63 are formed with -ya. Speaking of Sk. the derivatives with -ya are formed in all periods of the language whereas the other two are of later origin—being almost entirely absent in the Vedas (Whitney §962a). The same holds good with Pali.

The *infinitive* in -tuṃ is the commonest, but there is an appreciable number of Vedic forms in -tave. (Dative Infinitive); e.g. unnametave (Sn. 206b), dātave (Sn. 286d), vippahātave (Sn. 817d) and sampayātave (Sn. 843d).

Vedic and Dialectical Variations

§5. It is not only in the verb that Vedic and dialectical forms are preserved in Sn. Nominal themes too, both in their composition and declensional terminations show Vedic and dialectical characteristics. Many examples of such forms have been noted in the analysis of the suttas. To give a few more instances, the indicative 3 pl. (A'pada) in -re is seen to occur several times (*vide* Geiger, §122. 2), e.g. upadissare (Sn. 140d), dissare (688d), paṭijānare (601b), pithiyyare (1034d, 1035d), miyyare (575b), vijjare (20a), and socare (445d). There are a few instances of the ending -āmase (1 pl.), e.g. carāmase (Sn. 32b), sikkhissāmase (814d). The Vedic -as has already been

noted in jaras (Sn. 804d, 1123b), also cp. lūkhasā (Sn. 244a) and damasā, besides forms like manasā which are in frequent use in Pali.

There are at least 22 *double Vedic forms* in Sn.; of them as many as 17 belong to the Aṭṭhaka and Pārāyana Vaggas; viz. cutāse (Sn. 774d), avītataṇhāse (776d, 901d), sitāse (791a), paṭicchitāse (803b), pañhavīmaṃsakāse (827b), paṇḍitāse (875d, 876b), pavādiyāse (885b), upaṭṭhitāse (898b), saṅkhatadhammāse (1038a), samaṇabrāhmaṇāse (1079a-1082a), anāsavāse (1082f, 1083f)—in the Aṭṭhaka and Pārāyana Vaggas—and samūhatāse (Sn. 14b, 369b), paccayāse (15b), upāsakāse (367d), samuppilavāso (670d); also cp. the sg. rakkhitamānasāno (63b).

Dialectical variations are too numerous to give a comprehensive list here. The Māgadhī nom. sg. has been noted earlier. Besides this, various other forms belonging to dialectical strata have been pointed out. However, the following words are of special interest not only for the study of the Sutta Nipāta, but of the whole Canon. The Sutta Nipāta preserves many forms the parallels of which are to be found either in Sn. itself or elsewhere in the Canon. The word akalya occurs at Sn. 692a, (akaḷyarūpo, 691b) besides akalla at 456d; but in the case of tulya 377c, 85b, 683b there is no parallel form tulla in Sn. (cp. J. IV, 102), whereas tuliya occurs frequently in the Canon (s.v. P.T.S.). Such combinations of semi-vowels do not present a standard form in Pali (*vide* Geiger, § 54). cp. also -annaya (Sn. 243c) and -anvaya (Sn. 36b, 254a, 556b). The forms aggi, aggini and gini have been noted earlier. The form aggi occurs at least 8 times in Sn. in addition to the proper name Aggikabhāradvāja; aggini, 3 times (Sn. 668d, 670bd) and gini twice (Sn. 18c, 19c). The parallel observed (*loc. cit.*) was atta, ātuma, and tuma; atta occurs at least 45 times leaving aside cpds., ātuma, 3 times (Sn. 782d, 888b, 918d), and tuma twice (Sn. 890b, 908c). Substitution of consonants is to be noted in anītika (3 times) by the side of anītiha (also 3 times). The parallel form abhikkhaṇaṃ to abhiṇhaṃ (7 times in Sn.) is not to be met with in Sn. cp. tiṇha 3 times, but tikhiṇa and tikkha do not occur; also cp. timisa Sn. 669c. Similarly, aṅga does not occur though iṅgha is found 5 times. The particle iva (usually after original h, m, or inorganic r, m, or in combination with a + i ≥ e—sseva only—occurs 37 times, whereas va occurs 58 times (7 times after -ā 4 after -ī 3 after -e, 20 after -o and 24 after -m). But the later Pali form viya occurs only 5 times in the whole of Sn. The form chamā occurs at Sn. 401b, but samā the rarer form does not occur. Other parallel forms of interest are, iha at Sn. 460a (in tasmāt iha) as opposed to idha, over 90 times; uju and ujuṃ once each as opposed to ujju—7 times; ubho, the original dual 8 times as against ubhaya 5 times; eva 61 times as opposed to va 23 times (mainly *metri causa*) while yeva is seen 4 times; kasira and kiccha both occur once each (Sn. 574c, 676a); kukkuciya occurs once (Sn. 972d) and

kukkucca twice (Sn. 925b, 1106d); agiha occurs 4 times, gihī at least 6 times, gaha (cp. Rajagaha, 408a) in gahaṭṭha, 9 times, geha (nissita) at Sn. 280b and ghara 6 times; taccha occurs at Sn. 327d and 1096d, while tathiya at Sn. 883a and 368c; tatra occurs 4 times as opposed to tattha about 40 times; tamanudo is found at Sn. 1136a besides tamonudo at 1133a; thiyo at Sn. 796c has been noted earlier, and itthi occurs at Sn. 112a; divya occurs twice and dibba 4 times (cp. kalya); dhañña is seen 4 times as against dhāniya twice; usabha occurs 5 times whereas asabha occurs thrice in cpds.; the form nariyo (3 times) is probably a metrical variation of nāriyo and nāriṃ occurs at Sn. 836b; nahātaka is found at Sn. 646c whereas nhā- is seen at Sn. 518b, and 521d; pāda occurs 14 times (inclusive of cpds.) while pada 17 times (cp. padā and pādā); the form bhiyyo (11 times) is preferred to -bhuyyas (only once in prose); the forms sacchi- and sakkhi- have been discussed earlier; Sakka occurs 6 times, Sakya 10 times and Sākiya, twice; sāmin and suvāmin occur once each (Sn. 83b, 666b). The group sva- has been dealt with earlier.

§ 6. Sufficient has been said on the style of the suttas in general, as well as that of the individual suttas taken up for discussion in Part III. The general inference made earlier is that a more ornate and 'finished' style is an indication of lateness in composition. The table of alliteration and assonance in the gāthās given by Mr. Hare (*Woven Cadences*, pp. 220 ff.) and his list of śleṣas (*ibid.* pp. 218 ff.) clearly show that these poetic devices are employed most in the pieces which cannot be stated to be the oldest sections of Sn. On the other hand, onomatopoeia is not restricted to any one type of composition, yet it is apparently less in the earlier ones. Metre has been dwelt on at length in *U.C.R.*, VI, 1. The excellent analysis of the metres of Sn. by Helmer Smith (SnA: pp. 637 ff.) is a useful guide for the interpretation of the metres of Sn.

The *doctrinal trends* point to the realization of attha; the overcoming of birth, of misery ('Ill'), and of notions of self (mamāyita); the ascetic life and the Way Beyond are all attendant on the realization of this *summum bonum*. A comprehensive study of this aspect of Sn. has been made by scholars and it is not proposed to discuss it any further. (*Vide* Chalmers, Fausböll, Hare and Katre).

§ 7. The terms and epithets used in Sn. usually reflect an old phase. The following synthesis will be mainly restricted to the gāthās. The term muni is used 77 times in the gāthās. It is distributed in the five vaggas in the following manner: 26, 2, 17, 18 and 14. In 24 instances it is an epithet of the Buddha. It is significant that 8 of the 17 references in Mahā Vagga are to the Buddha, and a noteworthy feature is that the least references to muni are in the two vaggas which are not the oldest sections in Sn. (i.e. 2 in Culla Vagga and 9—excluding the 8 references to the Buddha—in Mahā

Vagga). Besides these, mona occurs at Sn. 718c, 723cd, moneyya at Sn. 484c, 698c, 700d, 701a, 716a and monapatha at Sn. 540c. Bhikkhu occurs 80 times in the gāthās, i.e. 22, 19, 15, 18 and 6 times respectively in the five vaggas in addition to over 15 times in the prose. Just as the term muni occurs a large number of times in Muni Sutta (18), bhikkhu is frequently used in the Uraga, Tuvaṭaka and Sammāparibbajaniya Suttas (17, 9, and 8 times respectively). The term sāvaka occurs only 12 times, and it is significant that it is not used in the Aṭṭhaka and Pārāyana Vaggas. Besides, these references are to be found in suttas which cannot be called particularly old. Five of these references are in the Dhammika Sutta, in which bhikkhu occurs 8 times but muni not once. Samaṇa occurs 31 times in the gāthās, and over 10 times in the prose (7, 1, 11, 8 and 4 respectively in the five vaggas). It is used in a wider sense than a Buddhist samaṇa in at least 17 out of the 31 occurrences. In the combined phrase, samaṇabrāhmaṇa it occurs 7 times in verse and once in prose. It is again curious to note that the word occurs only once in the Culla Vagga. The word brāhmaṇa occurs 141 times in verse and 12 times in prose (12, 16, 82, 8 and 23 times respectively in the five vaggas). The extra-ordinarily large number of references in the Mahā Vagga is due to the fact that it deals mainly with brahmin interlocutors; and in the Pārāyana, the majority of the references are in the vatthu-gāthā. Brahma occurs 43 times in the gāthās and 7 times in prose; i.e. brahma (Sk. brāhma) once, Brahmā 6 times, as an appellative (voc. brahme) 3 times, and the rest in cpds. including brahma-cariyā 19 times in gāthā and 9 other references connected with brahma-cariyā in both prose and verse. Brahma-loka is mentioned 6 times. There are only 3 references in the Uraga Vagga and one in Aṭṭhaka Vagga. Thera occurs only twice, and both in prose (discussed earlier). The word saṅgha occurs only 7 times apart from the 8 references in Ratana Sutta. It refers to the Saṅgha (apart from Ratana S.) probably only at Sn. 569d, 1015b (Pār. v.g.) and p. 16 (prose). The term Buddha occurs 39 times in the gāthās (i.e. 10, 5, 14, 1 and 9 times respectively in the five vaggas). Of these the personal Buddha is referred to 7, 3, 5, 1 and 9 times respectively in the five vaggas. All the references in the first three vaggas go with other epithets while the 9 references in the Pārāyana are to be found in the v.g. and epilogue. Bodhisatta occurs only once in the late vatthu-gāthā of the Nālaka Sutta. Sambodhi occurs 5 times. Sambuddha occurs 3 times in Uraga Vagga, 7 times in the Mahā Vagga and 9 times in the v.g. and epilogue of the Pārāyana. Bhagavā occurs 54 times in the gāthās and over 20 times in the prose. It does not occur in the Aṭṭhaka Vagga. Satthā occurs 12 times in verse and Sugato 4 times while each epithet is used at least twice in prose. Tathāgata occurs 21 times in both prose and verse; but it does not occur in the gāthās of the Uraga and Aṭṭhaka Vaggas.

In all the above instances it is quite clear that the early emphasis is on the muni or the bhikkhu and not on the saṅgha or the 'perfect' disciple nor on the personality of the Buddha. These aspects are taken up by the later poems.

§ 8. Coming to a few terms of general interest atta, dhamma, attha, saddhā, patha, magga, nibbāna and saṃsāra (bhava, etc.) demand attention The words atta (by itself and in cpds.) ātuma and tuma occur 105 times in the gāthās (i.e. 11, 14, 44, 29 and 7 times respectively in the five vaggas). Anatta has already been referred to. Atta meaning body or soul in the Brahmanic sense is found at Sn. 508b (Māgha's words), and 919a (a denial) and 800a (a doubtful context); atta (self) tending towards the Brahmanic concept is found at Sn. 514a and 709a; attānaṃ, the reflexive in objective case in 10 instances (and probably also at Sn. 709a). The possessive of the (pronominal) reflexive occurs in 13 instances, the reflexive agent attanā in 5 and the loc. of the reflexive attani in 3 instances and the ethic dative at Sn. 368a. All the three occurrences of ātumānaṃ appear to be reflexives (Sn. 782a, 888b, 918d). Mamatta (or mamāyita) occurs 12 times in the gāthās; 9 of these references are in the Aṭṭhaka Vagga. Amama also occurs 5 times. The word dhamma occurs 188 times in diverse meanings. Attha occurs 48 times in Sn. The significant references are Sn. 190d, 453c, 326c, 324d, 176a, 219a, 191c, 323c, 37b, 126a, 159d, and 320b. Saddhā occurs 16 times, but there is not a single reference to it in the Aṭṭhaka Vagga and the Pucchās. The words patha, magga and yāna have been discussed earlier. Nibbāna by itself and in cpds. occurs 15 times in Sn. The references are equally distributed in the five vaggas. There are 5 references to saṃsāra in the Mahā Vagga and bhava occurs 23 times in the gāthās (i.e. 6, 2, 5, 8 and 2 times respectively in the five vaggas) in addition to bhavābhavataṃ at Sn. 6b, itthabhāvaññathābhāvaṃ, 3 instances, vitathaṃ 9b-13b and vinābhāva at 588c, and 805c.

Conclusions

§ 9. As regards definite results which this investigation has yielded, one is confronted with various difficulties. Firstly, the diversity and disparity of the constituent parts of Sn. lead to contradictory data which result in conflicting conclusions. Secondly, the various religious elements which are not clearly separable rather tend to confuse the issue and are not helpful in any way in deciding the diverse strata these poems belong to. To give an example, the Buddha is referred to in many ways; Tathāgata, Gotama, Sakya and Buddha. Though these terms are interlinked there is an inherent subtle distinction as seen in phrases such as, Tathāgata-sāvaka, Gotama-sāsana, Samaṇa Gotama and Buddha-vacana. Thirdly, the archaic character of the language is sometimes very deceptive. It is not always that poems bearing an archaic stamp, linguistically, are genuinely old. This fact has been

stressed before and instances of this nature have already been noted; (e.g. Ratana Sutta). The Pali of the gāthās represents the standard vehicle of poetic expression, the archaic colouring being the outcome of a close adherence to what may be termed as the gāthā-style. Yet, the Vedic elements in Sn., as a rule, are generally confined to those sections to which an early date can be assigned on *collective data*. On the other hand, the late linguistic characteristics have yielded definite information. Finally, no definite and precise information can be gathered from the haphazard arrangement of the suttas in Sn., for, no final decision can be made from the present state of Sutta Nipāta which contains suttas put together at various dates and presenting no uniformity whatsoever. The different traditions in Pali and BSk. show that the development of these suttas is many-sided with divergent roots both in contents and form.

§ 10. In spite of these limitations the diverse strata as regards compilation as opposed to those of composition are discernible to some extent in the light of the information gathered in the course of our investigation. It is not our aim to determine the dates of composition of every Sutta. The internal and external evidence of the suttas selected for analysis in Part III has shown that the suttas of the Aṭṭhaka Vagga, the Pucchās of the Pārāyana and the ballads in praise of the Muni-ideal (found chiefly in the Uraga Vagga) are about the oldest sections in Sn. The general didactic poems found scattered in the first three vaggas and usually named after a simile or metaphor represent a subsequent phase. To the same period can be assigned the two opening suttas of the Mahā Vagga dealing with the Buddha's early career, the older dialogues in the Mahā Vagga, the dialogue-ballads of the Uraga Vagga and the Yakkha-ballads. Four of the five suttas of popular character (i.e. excluding Ratana *U.C.R.*, VII, 4), the Cunda Sutta and the Kokāliya Suttas appear to be a little younger but were definitely pre-Asokan. The Ratana, Vijaya, and Dvayatānupassanā were probably the youngest suttas in Sn. while the vatthugāthās (excepting those of the Rāhula Sutta) represent the latest compositions in Sn.

S. N. Katre in his *Early Buddhist Ballads and their Relation to the older Upanishadic Literature* assigns the period 500-300 B.C. to the ballads of Sn. From the data now available and the fact that due allowance should be made for the arising of Buddhistic literary activity among the adherents of Buddhism (for, the pieces in Sn. are decidedly literary compositions) the age of composition of the bulk of the poems may be narrowed down roughly to the period 400-300 B.C. This does not deny the possibility of a few ballads being anterior to the earliest limit of 400 B.C. Although it is not possible to estimate by what length of time the various classes of poems were separated it is evident that the earliest and the youngest poems show a great disparity as regards their respective ages of composition. On the evidence available it is clear that

individual suttas have to be taken on their own merits, though to some extent particular types of suttas have been vaguely generalised as belonging to distinct strata.

§ 11. This disparity in the dates of composition of respective suttas clearly implies a 'growth'. The stages by which the present anthology has come into existence underlie the various strata in Sn. Firstly, there appears to have been an early nucleus of a more or less floating material quite similar to the traditional Brahmanic knowledge of pre-Buddhistic and early Buddhistic times on which were based the subsequent Dharma Śāstras and the early didactic literature of the Hindus. It is not only in thought and ideology that these early ballads of the Buddhists bear kinship with early Brahmanic literature (*vide* Katre) but also in phraseology and literary modes, all of which reflect a common background. This is not confined to the so-called 'unsectarian' ballads of Sn. which deal with general Indian or 'Āryan' teachings (embracing the ethical principles of Brahmanic teachings and Upaniṣadic lore) but is much in evidence even in poems which are considered as being distinctively Buddhistic.

The earliest attempt at a collection as such belongs to a subsequent period. Many of the poems in the Aṭṭhaka Vagga and the Pucchās of the Pārāyana are of a sectarian character on a broad basis. Although the general outlook of these poems is rather wide there is something characteristically Buddhist underlying them, as contrasted with poems of common Brahmanic and Buddhist origin. There is no doubt that the Aṭṭhaka and Pārāyana Vaggas and the Khaggavisāṇa Sutta formed the foundation on which this collection of suttas was built. In doing so the compilers have drawn freely from a floating tradition.

The transitional stage (or stages) of the formation of a nipāta was (or were) marked by the incorporation of these suttas as well as many others deemed as being truly representative of the Buddha's teaching. No definite conclusions can be arrived at regarding these intermediate stages. The present arrangement of the suttas in the Uraga Vagga (with the Khaggavisāṇa Sutta occupying the third place in it) shows a certain amount of re-shuffling to furnish a more effective presentation of the suttas; for, Uraga with all the mysterious significance attached to it was probably considered as a suitable sutta to be placed at the head of the anthology.

As noted earlier (*U.C.R.*, VI, 2), the Uraga Vagga appears to be older than the next two vaggas. In view of the internal changes that have taken place in the various vaggas (*ibid.*) it is quite clear that the final redaction of Sn. has been preceded by several intermediate redactions (though they cannot be easily enumerated). The Culla Vagga and the Mahā Vagga have not come into their present form by any historical sequence. As suggested earlier

(*loc. cit.*), the two vaggas (perhaps together with Uraga) probably replaced an older group (or vagga) which contained suttas of popular appeal. The final phase was marked by the prefixing of Uraga, Ratana and Pabbajjā (and Padhāna) Suttas to the three respective vaggas under the editorial hand of monastic redactors for the purpose of propagating the Dhamma.

§ 12. Thus, the results of this investigation can be briefly summarised under the two heads (*a*) tradition and (*b*) growth :—

Sets of suttas with reference to tradition :

1. Unsectarian :
   - (*a*) General Indian, 'Āryan' or Brahmanic (Upaniṣadic) teachings;
   - (*b*) The ascetic ideal.
2. Sectarian ('Buddhist'):
   - (*a*) Suttas purporting the Buddhist point of view;
   - (*b*) Suttas with special Buddhist interpretations of then-current themes, values and concepts ;
   - (*c*) Buddhist Dogmatics ; and Suttas representative of the ecclesiastical phase.
3. Popular Buddhism ; Suttas of the Life of the Buddha, and legend.

The main trends of growth :

1. An early nucleus of more or less floating material.
2. Several intermediate redactions incorporating suttas of popular Buddhism, dialogues, Buddhist ethics, life of Buddha and Buddhist worship.
3. A final redaction made for the purpose of propagating the Buddhist faith through its ecclesiastic representative, the Saṅgha.

(*Concluded*).

N. A. JAYAWICKRAMA

Family Characteristics and Occupational Choice of University Entrants as Clues to the Social Structure of Ceylon[1]

1. Introduction

IT is unlikely that a classless society ever has, or (in a technologically complex civilization), can exist. However, vertical social mobility—the movement of individuals from one social strata to another—is a viable policy objective for a democratic state. Indeed even aside from ethical considerations, the facilitation of social mobility is desirable in order to maximize the human resources of the nation. For these reasons, and also for the purposes of better understanding the functioning of a society, it is important to have some idea of the extent to which such movement is taking place. This is especially true of a newly independent country such as Ceylon, which is undergoing vast changes in its educational system, and whose declared national policy includes the eventual replacement of foreigners holding posts in Ceylon, with Ceylonese nationals. In connection with the 'Ceylonization' policy, it is also of considerable importance to know the occupational plans and preferences of the university students who will be called upon to take over many of these posts.

There must be a large number of factors aside from those associated with differential social class membership, which influence the decision to attend, or not to attend an institution of higher learning. Some of these are related to the value system of certain sub-cultural groups, irrespective of economic level. For example, clerical workers as compared to skilled tradesmen, or religion 'A' as compared to religion 'B'. In addition, the personality characteristics of the particular individual concerned must also be an important factor.

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1. The research reported in this paper was made possible by a research grant of the University of Ceylon. The interviews were conducted as the students reported for their medical examination through the co-operation of Dr. H. Cullumbine, Professor of Physiology, who contributed generously both with his own time, and with the facilities of the Department of Physiology; and of Dr. H. M. P. Perera, the University Medical Officer. I also wish to express my appreciation to Bryce Ryan, Professor of Sociology, for his co-operation and assistance in every phase of the research. The opinions and conclusions expressed in this paper are however my own, and do not necessarily represent the views of the University of Ceylon, or the individuals named above.

The present paper seeks to examine (within the limits of the available data) the social and economic background of students entering the University of Ceylon, and their occupational choices, for purposes of analyzing the selectivity of the student population as compared to the total population of Ceylon. In many countries one of the most important channels through which social mobility takes place is the educational system, and especially the universities. Special attention will therefore be paid to the problem of gaining some idea of the extent to which social mobility is taking place in Ceylon through the university.

The data on which this study is based, were obtained from a 50 per cent. interval sample of 1950 Ceylon University entrants which is being studied as a part of the research program of the Department of Sociology. The sample consists of 212 students (143 men, and 69 women). All per cent. tables reported in the paper, are based on this number of cases. Certain of the information is also obtainable for the total student population in the Vice-Chancellor's report[2]. However, the data from the sample of the entering students was used because the paper is concerned with selective factors in respect to those who enter the university. In any case, there are only minor discrepancies between the figures computed from the Vice-Chancellor's Report and the entering student population, none being larger than 7·5 per cent.

2. Results and Interpretation

Father's Occupation: Under present social and economic conditions in Ceylon, and indeed throughout the world (including the Soviet Union), it is to be expected that a major share of university students will come from the upper socio-economic strata[3]. One widely employed technic for determining the socio-economic position of a family, is through the occupation of the head of the household. The father's occupation of each of the entering student sample was therefore grouped according to a modification of the Edwards

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2. University of Ceylon. *Eighth Annual Report of the Council* (1949), Colombo. Ceylon Government Press, 1949.

3. Hollinghead, A. B. *Elmtown's Youth*, New York, John Wiley & Sons, 1949.

Inkeles, A., ' Social stratification and mobility in the Soviet Union, 1940-1950 '. *American Sociological Review*, 15: 465, 1950.

Sibley, E., ' Some demographic clues to stratification', *American Sociological Review*, 47 : 322, 1942.

Socio-Economic Classification, and the results are presented in the following table[4]:—

Table 1: Occupation of father's of Ceylon University students, by socio-economic category, 1950.

SOCIO-ECONOMIC GROUP	*Per cent.*	
	Males	*Females*
Professional	22·3	42·0
Proprietor	17·5	8·7
Manager	16·1	18·8
Teacher (non-university)	12·6	7·2
Plantation Crop Farmer	7·0	8·7
Paddy Farmer	6·3	1·4
Clerical Worker	13·3	11·6
Skilled Worker	4·2	1·4
Semi-skilled and Unskilled Worker ..	—	—

The above distribution of father's occupation is interesting in several respects. First, as expected, the vast majority of the student population come from families in the upper socio-economic categories. It would be interesting to compare the occupational distribution shown in Table 1, with that for the total working population of Ceylon, but this cannot be done as the census figures are tabulated by industry rather than type of work. However the census does report that 3·1 per cent. of the gainfully employed are engaged in the professions, and the comparison of this figure with the proportion of student's fathers so occupied, is illuminating[5]. There are no students at all from families in the semi-skilled or the unskilled worker categories, and only 6·3 per cent. of the men, and 1·4 per cent. of the women are from the rural peasantry which constitutes the bulk of Ceylon's total population[6]. On the other hand, it is significant that there are any sons and daughters of this class at all. In the same way, the presence of children of fathers in Skilled Worker category and many of those in the Clerical Worker category shows that higher education is at least beginning to be diffused through all levels of Ceylonese society. While progress has been slow and uncertain, the government of Ceylon is committed to a program of equal education opportunity

4. Edwards, A. M., *A Social and Economic Grouping of the Gainfully Employed Workers in the United States*, Washington, D.C., Bureau of the Census, 1938.

5. Ranasinha, A., G. *Census of Ceylon* 1946, *Volume I, Part I—General Report*, Colombo, Ceylon Government Press, 1950.

6. This analysis probably understates the socio-economic selectivity of university education in Ceylonese society, since many of the highest status group—comparable to Warner's 'upper-upper' class—send their children to England for university education.

for all, and as this program takes shape, it is likely that the trend just mentioned will grow. In any case, it is clear from the above analysis of father's occupation that only a relative small amount of upward social mobility is taking place through the medium of the university.

Attention should also be called to the fact that 42·0 per cent. of the female student's fathers are professional men, as compared to only 22·3 per cent. of the men student's fathers. The women students thus come from an even narrower segment of the total population than do the men. Moreover, in spite of the fact that the number of women students at the university has been increasing rapidly in the past few years, the ratio is still about four male students for every female student. These two facts are not surprising in view of the subordinate place which women traditionally occupy in Ceylonese society, and it can be inferred that such restrictions are breaking down most rapidly among professional people.

In addition to the occupation of their father, the students were also asked by whom their father is (or was) employed. It was found that almost half the population of freshmen students, are the children of government employees (49·1 per cent.). As for the approximately 50 per cent. of fathers not in the government service, they are about equally distributed between private employment, self-employment, and those living on income from land or investments.

Father's Education: Closely related to the previous discussion of father's occupation, is the amount of formal schooling completed by the father.

Table 2 : Amount of education of fathers of Ceylon University entrants, 1950.

	Per cent.	
	Males	*Females*
Less than 3rd Standard	5·6	—
3rd to 7th Standard	22·4	11·6
Junior Cambridge	24·8	21·7
Senior Cambridge	16·0	37·8
Senior Cambridge and Non-University technical or professional training ..	16·8	37·7
Some University Study	3·5	4·4
University Degree	11·9	8·7

Although Table 2 indicates that Ceylon University students tend to come from families in which the standard of educational attainment is fairly high, the proportion of students whose father had reached only the seventh standard or less is larger than might be expected *a priori*. This is especially notable

in the case of the male students, 28 per cent. of whose fathers had not gone beyond the seventh standard in their formal education. This points up the selective character of women university students in Ceylon to which reference has already been made. Another way of demonstrating the same point, is to convert the intervals in Table 2 into years of schooling. The mean number of years completed by the fathers of the men students is 11·3 as compared to 12·1 for the fathers of the women students. The critical ratio for this difference is 1·64 which is significant at the ·10 level[7].

Interpreting the data of Table 2 from another angle, it can be seen that in spite of the selective character of the students already discussed, the proportion of students whose father completed any university education is not large. Only 15·4 per cent. of the fathers of the men students and 13·1 per cent. of the women student's fathers had done so. Thus even among the relatively well educated section of the Ceylon population which can provide its children with a university education, the standard of educational attainment is increasing sharply between these two generations.

Social Class Self Placement: The students were asked to what social class they belonged. A fully structured question allowing four alternatives, and a space to write in a free choice was employed. The question was asked not so much to ascertain with any degree of accuracy the actual position of their families, but as one way of obtaining information about their outlook on life for use in connection with the studies in the field of culture and personality which are now in progress. Whether or not an impartial skilled observer would apply the same terms cannot be said. However, analysis of the data indicates that the social class in which the students placed themselves, is correlated with other more objective indices of social status.

Table 3: Social class self placement of Ceylon University entrants, by sex, 1950.

CLASS	*Per cent.* *Males*	*Females*
Upper	8·4	10·2
Upper Middle	54·5	73·9
Lower Middle	35·0	14·5
Lower	0·7	—

In the first place, it can be seen that the women students assign to themselves a considerably higher social class position, as compared to the self evaluation of the men students. In the previous discussion of father's occupation

7. Critical ratio formula from McCormick, T. C., *Elementary Social Statistics*, New York, McGraw Hill, 1941.

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and education, it was shown that the fathers of the women students in general occupied a higher position on the occupational ladder, and had more formal education. Since both occupation and amount of education are known to be positively correlated with social class position, this may be taken as indicating a certain degree of validity for the social class self evaluations of the students.

Second, each student was given a rating in respect to the socio-economic status of his home, as judged by the presence or absence of certain items of personal property such as a car, a radio, the reading of a daily newspaper, etc. These economic status score were found to be correlated with the social class self placement of the students, as evidenced by a coefficient of contingency of $\bar{C} = \cdot 50$. In addition, when the mean scores of the men and women students are compared in respect to this crude socio-economic scale, the higher status which the women students assign to themselves, is again confirmed. The respective scores are men : 3·85, and women : 4·55. The critical ratio of these scores is 2·38 which is significant at the ·05 level.

It seems clear from the discussion of father's occupation, of father's formal education, and of the social class self evaluations that women students are on the average a group coming from families of higher socio-economic status, and superior educational attainment. In spite of this advantage, there is evidence that the academic ability of the women students is lower than that of the men. The scores of the women students on a standard test of intelligence were found to average significantly lower (C.R. 2·5) than those of the men[8]. In addition the 'grade point' average for the university entrance examination was computed for each sex, and the women students were again found to score below the men. The average score of the women was 1·14 and that of the men 1·24. The critical ratio of this difference is 1·8 which is significant at the ·07 level. In view of the family background characteristics of the women students it is unlikely that the relatively poor performance can be attributed to selective factors. A more plausible explanation is based on the subordinate social position held by women in Ceylon to which reference has already been made. It is possible that the curtailment of participation in many areas of activity which this entails, has had a limiting effect on the possibilities for intellectual development of Ceylonese women. In addition, data to be presented later in this paper indicate that in contrast to American women students, the Ceylonese woman student does not generally anticipate a period of gainful employment. She especially does not anticipate sitting for the civil service examination which is a dominant motivation for a very large proposition of the male students. There would therefore seem to be

8. Straus, M. A. 'Mental ability and cultural needs : a psycho-cultural interpretation of the intelligence test performance of Ceylon University entrants'. Paper read at the 38th Indian Science Congress, Bangalore, 1951, and to be published in the June 1951 issue of the *American Sociological Review*.

grounds for attributing at least part of the poor test scores to a lack of motivation throughout much of the period of formal education, as well as to the more externally imposed restrictions previously mentioned.

Family Size and Composition: Just over one-quarter of the students (25·5 per cent.) come from incomplete families, e.g. families in which one or both parents dead, or as in the case of two students, the parents are divorced.

In comparison to European and American families of comparable social and economic position, the average number of children is quite large: male students report an average of 5·2 living children per family, and the female students 5·4. Since the students average just over twenty years of age, the families from which they come will have in most cases very nearly completed their reproductive cycle, and it would therefore be interesting to compare these data with the mean number of children per completed family for Ceylon as a whole, in order to see if the Western pattern of lower birth rates among the educated classes, is being repeated in Ceylon. Unfortunately, the census has not yet published information which would permit such a comparison. However, it may tentatively be concluded that this evidence argues against the existence of differential fertility between social classes in Ceylon. In the first place, the average number of children per student family approaches the biological limit for *average* number of children per completed family (about eight). Therefore, even if there were socio-economic differences in fertility, this factor alone limits their magnitude. Second, it has already been demonstrated that the women students come from families of higher socio-economic status, and superior education as compared to men. If there were differential fertility, then the women students should have a smaller average number of siblings, whereas just the reverse has been found to be the case.

It is important to note that even if some slight fertility differential were found, the existence of this relative difference would not detract from the significance of the high birth rate prevalent among the families of university students. Among other things, it is probably one reason for the smaller amount of vertical mobility in Ceylon as compared to the United States. In the United States the net reproduction rate of the higher occupational and educational strata is extremely low and this has given children coming from the more prolific lower socio-economic strata the opportunity to replace them in the next generation.

Home Language: The students were asked which language was most frequently spoken in their own home, among family members. Only about six per cent. of the student population are from an ethnic group whose traditional language is not Sinhalese or Tamil, yet almost one out of every four students indicated that English was the home language (as defined by the question). This is to be compared with the 6·3 per cent. of the total population of Ceylon which is recorded in the 1946 census as literate in English. This

is obviously related to the socio-economic selectivity of the student population previously discussed. However, other factors also contribute to the relatively high proportion who speak English as a home language. For example, it may be that since the medium of instruction and of examination is English, that those who speak English at home have an advantage due to their greater skill in the use of that language. If this is correct, then it is to be expected that a larger proportion of such candidates will be successful in gaining admission to the university. In addition, it may not be a question of differential ability at all, but rather one of differential motivation. Home language is the traditional stronghold of any culture. It is not unreasonable to suppose that those families which have adopted English as the medium of daily intercourse, are also the most Anglicised in other respects, and this would naturally include the desire to have their children receive the essentially Western education which is offered by the University. It is most likely however that both of these explanations are factors in the total situation.

Religion: Since Buddhists are by far the largest religious group in the country, it is to be expected that they will also constitute the largest group of entering students. The distribution of students religious affiliation presented in the following table bears out this expectation.

Table 4: University entrants, and total population, by per cent. of each religion, Ceylon, 1946 and 1950.

RELIGION	*Per cent. of* 1950 *University Entrants*	1946 *Population of Ceylon*	*Per cent. under or over representation*
Buddhist	48·6	64·5	−24·7
Hindu	17·0	19·8	−14·1
Muslim	1·9	6·6	−71·3
Catholic	15·1	7·6	+98·7
Protestant and Other	17·5	1·5	+1,070·0

However, more intensive examination of the proportion of students belonging to each religion, indicates that the situation is far from a simple proportionate representation of each religious group in the total population. The last column in Table 4 shows that certain groups are under represented and others are decidedly over represented among the entering student population. Specifically, the three indigenous religions are under represented, and the Christian groups over represented. It is unlikely that this indicates any difference in the relative ability of the groups concerned. Much more plausible, is to explain these differences in terms of the values, and way of life of the groups under discussion. It may be that the extent of under or over representation is a reflection of the relative conservativeness, or perhaps of the degree to

which westernization has occurred among the groups concerned. On a less speculative level, it should be pointed out that the upper levels of Ceylonese society contain proportionately more Christians than do the lower socio-economic strata, and especially the rural peasant classes; and it has already been demonstrated that the student population comes predominantly from the upper socio-economic strata.

Ethnic Group: A similar pattern of over and under representation occurs in respect to ethnic group or 'community'. Particularly prominent are the under representation of the Kandyan Sinhalese and the over representation of the Ceylon Tamil, and especially of the Burghers.

Table 5: University students and total population, by per cent. in each ethnic group, Ceylon, 1946 and 1950.

ETHNIC GROUP	*Per cent. of* 1950 *University Entrants*	1946 *Population of Ceylon*	*Per cent. under or over representation*
Kandyan Sinhalese	6·6	25·8	−74·5
Low-Country Sinhalese ..	60·0	43·6	+37·6
Ceylon Tamil	24·5	10·0	+145·0
Burgher	5·7	0·6	+850·0
Ceylon Moor and Muslim ..	1·9	5·6	−60·6
Indian Tamil and other 'races' ..	1·4	14·4	−90·3

Occupational Plans: Just as the majority of the student's fathers are government employees, so the sons and daughters express a corresponding, but still more pronounced preference for employment in the government service. The overwhelming majority (62·7 per cent.) would prefer to work for the government. Next in order of preference but a poor second with 17·4 per cent. are those who don't care whether it is a private employer, the government, etc. As for self employment, 15·6 per cent. indicate such a preference, but in most cases, this referred to a professional practice. Only 3·8 per cent. said that they would prefer to be employed by a private firm. The reasons for this unparalleled preference for the government service are many and complex. Among those that seem most obvious are the prestige of occupying posts once filled by the ruling Europeans; the high value which Ceylonese seem to place on 'security'; and the preferred bargaining position of the civil servant in respect to dowries. In any case, whatever the reason, the status and prestige of the civil service is probably a phenomenon that is

unduplicated elsewhere in the world, and it is at least a half truth to say that the university is a government department designed to prepare the children of government employees for the government service.

The specific occupational choices of the students were grouped according to the Edwards classification in the same way as the actual occupations of their fathers discussed above.

Table 6: Occupational choice of Ceylon University entrants by socio-economic category, 1950.

SOCIO-ECONOMIC GROUP	*Per cent.*	
	Males	*Females*
Professional	51·0	21·7
Proprietor	2·1	—
Manager	4·2	—
Teacher (Non-University)	5·6	13·0
Plantation or Farm Operator	—	—
Clerical Worker	0·7	1·4
Undecided	36·4	63·8

The high proportion of women students who did not make an occupational choice is of course to be expected, and it can be inferred that this was because they did not anticipate gainful employment of any sort. However the 36·4 per cent. of men students who were undecided in respect to future occupational plans is something which may indicate the need for a program of vocational guidance. This figure is about twice that found in several studies of the occupational choice of American students[9]. Also pointing towards the need for a program of vocational guidance is the excessive emphasis on government service previously mentioned, and the fact that even through the cultivation of tea, rubber and coconuts is the major industry of Ceylon, not a single student indicated a preference for planting as an occupation. The lack of interest which the students display in commerce, and in planting probably represents in part, a realistic evaluation of the demand situation in respect to the employment of Ceylonese nationals. Evidently these students do not have much faith in the success of the Ceylonization policy.

3. Summary

The pattern of occupational choice, and certain characteristics in the social background of a 50 per cent. interval sample of 1950 Ceylon University entrants

9. Hollingshead, A. B. *Elmtwn's Youth*, New York, John Wiley & Sons, 1949.
Menger, C. *The Significance of Vocational Choices of School Children and College Students*, New York, Privately printed, 1932.
Nelson, E. 'Father's Occupations and Student Vocational Choices'. *School and Society*, 50: 572, 1939.

was examined with special attention to the problem of social selectivity of university students, and of obtaining some idea of the extent to which social mobility is taking place through the medium of the university. The findings may be summarized as follows:

1. While there is the expected concentration of students coming from families of relatively high socio-economic status, there are a considerable number of students whose fathers are clerical workers, and even some from the ranks of skilled workers.

2. Entering students have at least some conception of the social class position of their families. Most of the students placed themselves in the 'upper middle' class.

3. Fathers of men students averaged 11·3 years, and of women students 12·1 years of formal education. However more than one-quarter of the men student's fathers had not gone beyond the seventh standard.

4. While the women students in general come from families of higher socio-economic status, and superior education as compared to the men, their average ability as measured by a standard intelligence test, and the university entrance examinations, is lower.

5. Compared to American and English university students, the families of Ceylon students are quite large, averaging over five children per family.

6. About 25 per cent. speak English as a *home language.*

7. Of the religious groups, Buddhists constitute the largest single block of students. However in terms of the total population of Ceylon, they are under-represented, as are the Hindus, and the Muslims. Christians, and especially Protestant Christians are sharply over-represented in the student population.

8. Of the ethnic groups, the Indian Tamils, the Kandyan Sinhalese, and the Moors and Muslims are under-represented, while Low-Country Sinhalese, Ceylon Tamils, and especially the Burghers are over-represented.

9. An overwhelming preference for government employment is an outstanding characteristic of the student's occupational choices. The majority of the students wanted professional employment, and only 2 per cent. of the men wanted to enter business. None at all expressed a preference for Ceylon's major industry: planting.

MURRAY A. STRAUS

A Restatement of the Modern Roman-Dutch Law

ON the first day of the present century there came into force throughout the German Empire the great German Civil Code (*Burgerliches Gesetzbuch*), the preparation of which had occupied a number of the best legal intellects of Germany for more than twenty years. In England its appearance was hailed with enthusiasm by F. W. Maitland, then Downing Professor of the Laws of England at Cambridge University, as ' the most carefully considered statement of a nation's law that the world has seen ',[1] and he commended to his own countrymen the example of the Germans who, he said, were ' facing modern times with modern ideas, modern machinery, modern weapons '.[2]

Although Maitland's exhortations did not lead to any result in England in the way of general codification, it is of interest to note that his enthusiasm for simplified restatement of law was responsible for a friend of his Cambridge undergraduate days undertaking in distant Ceylon a much more formidable task than that of restating the law of England. In the Preface to the first volume of Sir P. Arunachalam's *A Digest of the Civil Law of Ceylon*, published in 1910, which was an attempt ' to make a digest of the existing law (of Ceylon) which might be used in the preparation of an authoritative code ',[3] the author acknowledges that his friend Maitland ' was much interested in the project and helped me with advice and encouragement '.[4]

In England also, on the suggestion of the Berlin Society for Comparative Jurisprudence and Political Economy, a *Digest of English Civil Law*, modelled on the pattern of the German Civil Code, was planned under the general editorship of Professor Edward Jenks and published in the years between 1911 and 1917. Lawyers in Ceylon, however, will naturally be more interested in attempts to restate the Roman-Dutch Law, the common law of Ceylon and of South Africa, as applied in modern times by the courts of those two countries : for, to restate the Roman-Dutch Law, ' to explore what seems a gloomy and

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1. Introduction to *Political Theories of the Middle Age*, being a translation by Maitland of Otto Gierke's *Das deutsche Genossenschaftsrecht*. Cf. also : ' Never yet, I think, has so much first-rate brain power been put into an act of legislation '. Maitland, *op. cit.* in n. 2 *infra*.

2. *The Making of the German Civil Code*, reprinted in *Collected Papers of F. W. Maitland* (edited by H. A. L. Fisher), Volume 3, pp. 474-488.

3. Preface, p. viii.

4. *ibid.* p. xiii.

intricate forest guarded by old-world dragons',[5] is obviously a much more difficult task than to restate the law of England which has already been tolerably well expounded in many modern text-books.

The first such attempt at restating the modern Roman-Dutch Law, Sir P. Arunachalam's *A Digest of the Civil Law of Ceylon*, already referred to, was unfortunately never completed. The first volume, dealing with *Persons, Natural and Juristic*, was all that appeared before the distinguished author turned his attention from law to politics and philosophy. No other systematic restatement of Ceylon law in the form of a code has ever been attempted. Consequently Ceylon lawyers will be particularly interested in the appearance of a work published in South Africa,[6] edited and to a large extent written by Professor R. W. Lee, (one of the original contributors to *A Digest of English Civil Law*), which restates the South African Law of Obligations in the form of a code.

Professor Lee, the greatest living authority on the Roman-Dutch Law, (the study of which as a living system in South Africa and Ceylon he has done so much to foster), needs no introduction to Ceylon lawyers. His *An Introduction to Roman-Dutch Law*, ever since its first appearance in 1915, has come to be accepted by both practising lawyers and students as the most convenient work of reference on the subject. The new book entitled *The South African Law of Obligations*, prepared under his editorship, will consequently be welcomed by users of the *Introduction* as in effect constituting a revised commentary on and supplement to the earlier work. A little more than two-thirds of the new book is by Professor Lee himself. The sections on Delict, Quasi-Contracts, Mandate or Agency, Partnership, Loan for Consumption, Loan for Use, Deposit, Carriage of Goods and Passengers, and Hotel-keepers Liability, (not all of which are from his pen), will be found especially useful as supplementing the rather concise treatment of these topics, (which was all that was possible in an elementary treatise), to be found in his *Introduction*.

If ever the Roman-Dutch Law as applied in Ceylon or South Africa has to be codified, the present work will inevitably be largely availed of by the draftsmen of the code. Even practising lawyers or laymen who need a handy source of information from which an answer to a question of principle can be readily obtained may confidently turn to the new book for a concise statement of essential principles uncomplicated by an elaboration of details. Law-students may, perhaps, find the narrative form of the *Introduction* more to their liking on a first acquaintance with the subject, but even they will find in the Articles of *The South African Law of Obligations* a revised and concise statement of the law which will be invaluable especially for revision. The

5. *ibid.* p. vii.

6. *The South African Law of Obligations*, edited by R. W. Lee, published by Messrs. Butterworth & Co. (Africa) Ltd., 1, Lincolns' Court, Durban, South Africa, 1950.

new work will also be found useful for comparative study of English and Roman-Dutch law, for the sections dealing with Contract are for the most part from the pen of Professor Lee, who was also responsible for the corresponding portions of *A Digest of English Civil Law*.

An enumeration of the chief points on which the treatment in the new work is a correction of or an improvement on that in the earlier book will, perhaps, be found useful by practitioners and students. One of the few incorrect propositions in the *Introduction* appears on page 307 of the Fourth Edition (published in 1945), where the measure of compensation for necessary improvements to property is said to be the extent to which the value of the land has been enhanced : in other words, the measure applied to *useful* improvements has here been applied also to *necessary* improvements. This view, in spite of loose judicial statements to that effect, is not borne out by the old texts,[7] and in Article 390 of *The South African Law of Obligations* the measure of compensation for necessary improvements is now correctly stated to be the cost of the work. In Article 713 of the Third Title of the third part on Quasi-Contracts (written not by Professor Lee, but by Mr. A. M. Honore) the mistake is however repeated.

Article 333 of *The South African Law of Obligations*, read with the preceding Article, corrects the first sentence of the second paragraph of page 296 of the *Introduction* which deals with the remedies of the purchaser in the event of eviction. The sentence in the *Introduction* might, therefore, be amended to read something like the following :—' In case of eviction the purchaser may claim a refund of the price and damages (if the price has not been paid, damages only) measured by the increase, if any, in the value of the property at the date and place of eviction, together with costs incurred in respect of the eviction, as well as any compensation to which the purchaser as *bona fide* possessor may be entitled for necessary and useful improvements if he has not recovered these from the true owner '. Again, the word ' lessor ' in the first line of page 309 of the *Introduction* is a slip for ' lessee ', as will be seen from the correct statement in Article 387 on page 102 of *The South African Law of Obligations*.

These are the chief instances of *Corrigenda* in the *An Introduction to Roman-Dutch Law* which have been corrected in *The South African Law of Obligations*. Many examples are also to be found in the new book of *Addenda* to the *Introduction*, which in some respect or other are improved or revised statements of what was less fully or less clearly expressed in the *Introduction*.

Thus, no mention is made on page 288 of the *Introduction*, where acceptance of gifts is dealt with, of the time when acceptance may be made

7. See the present writer's *The Roman-Dutch Law of Fideicommissa* (1949), p. 144 and notes 62 and 63 at p. 162.

by a donee: Article 271 of *The South African Law of Obligations* supplies this omission. The attitude of the modern courts of South Africa and Ceylon to the *stipulatio poenae* was in the *Introduction* all too concisely summed up (at page 268) by the statement that 'the modern law has taken over the English distinction between Penalties and Liquidated Damages'; but Articles 215 to 218 of *The South African Law of Obligations* remedies that defect by a clear explanation of that distinction. Similarly, 'duress of goods' which is not explained in note 8 of page 233 of the *Introduction* is explained and distinguished from 'duress' in Article 59 of *The South African Law of Obligations*. Article 62 of the latter work, which deals with the three constructions that are possible when a statute attaches a penalty to the doing of an act, is a fuller and more accurate statement than the corresponding sentence on page 237 of the '*Introduction*' which leaves ambiguous the relation between the two terms 'illegal' and 'void'. Again, Article 210 of *The South African Law of Obligations*, which deals with the power of a contracting party who has performed his obligations only in part to sue the other, is a fuller and clearer statement than the corresponding sentence in note 1 of page 264 of the *Introduction*. Finally, the substance of Article 259 of *The South African Law of Obligations*, which mentions what is in effect an exception to the ordinary presumption of Roman-Dutch Law that a co-debtor cannot be made liable *in solidum* unless there is a special agreement to that effect, might well have been incorporated, even as a footnote, on page 285 of the *Introduction*.

The printing and the binding of the new book, which have been done in South Africa, are quite up to the standard of the best English work and leave nothing to be desired. As already mentioned,[8] Mr. Honore is incorrect in not pointing out in Article 713 that the measure of compensation for necessary improvements is not the same as for useful improvements. Apart from this, only three slight mistakes have been detected. 'Ruben' in Article 385 should be 'Rubin', and 'guaarntee' in Note 3 to Article 379 gives an Afrikaans like touch to 'guarantee'; while the reference in the last line of Article 260 to '*Lee*, 290' seems to be wrong.

In his Preface to *The South African Law of Obligations*, Professor Lee explains the circumstances in which what was intended to be the first volume of a comprehensive digest of the civil law of South Africa has had to be published as a separate work; but he says that 'the editors do not abandon the hope of completing the work in a second volume which would include the Law of Property, the Law of Succession and the Law of Persons'. The present writer had the privilege, whilst working at Oxford under Professor Lee's direction in 1947, of reading through Professor Lee's manuscript of a digest of the Law of Succession, and it is earnestly hoped that in the not too distant future

8. See p. 138 *supra*.

the projected second volume of the *Digest of the Civil Law of South Africa* will see the light of day.

In Ceylon there is much glib talk nowadays of the necessity of codifying our law on modern lines by people who forget that, as Mr. Gladstone once said in the House of Commons, a comprehensive account of the existing law is necessary before that law can be amended.[9] A restatement of our law on the model of Sir P. Arunachalam's pioneer but unfinished *A Digest of the Civil Law of Ceylon* and of Professor Lee's *The South African Law of Obligations* is, therefore, a vital necessity, not merely as a basis for possible codification in the future but also as a work of reference for students and practitioners.[10] Perhaps when the staff of the Law Department of the University of Ceylon is increased, and the burden of routine teaching which at present falls on its shoulders is reduced, it will be the privilege of the University to present to the lawyers of this country the comprehensive *Digest of the Civil Law of Ceylon* which is long overdue.

T. NADARAJA

9. quoted in Sir P. Arunachalam's, *A Digest of the Civil Law of Ceylon*, Vol. 1, Preface, p. viii.

10. See the present writer's article, *The Uncertainty of Our Law—a Plea for a Restatement*, in the *Ceylon Daily News* of 5th and 6th April, 1946.

Saṅgharāja who later became a Monarch

SIAM (= Thailand) is the only Buddhist kingdom now existing in the world. About 90 per cent. of the Siamese nation consist of a primitive peasantry entirely devoted to agricultural pursuits, with an infusion of Chinese merchants, tradesmen, and artisans. The remainder include the sovereign and his court, the uncles, brothers, cousins, and nephews of the king, with their households, engaged in the administration.

Siamese Buddhism is similar in its tenets to that of Burma and Ceylon. The king is in fact religious primate, and there is a complete hierarchy by law established, as well as an ecclesiastical department to control the secular affairs of the Church. There are over ten thousand monasteries, and the monks number nearly two hundred thousand.

The Siamese kingdom was consolidated in about 1350 A.D. when they founded their capital Ayudhya (= Ayuthia). The period from 1350 to 1765 A.D. constitutes the Ayuthia era. With internal upheavals, and struggles with Burma and Cambodia, this period seems to have been one of almost continual war. In 1550 Ayuthia was taken by the Burmese, and the Siamese king was carried into captivity. Thirty years later a complete recovery had been made, Burmese armies had been defeated, and Pegu pillaged, and a successful war had been prosecuted against Cambodia.

In 1759 a serious war with Burma broke out again, Aloung Pra, king of Burma, invading Siam with a great army. Ayuthia was invested, but the Burmese king died and his army thereupon retired. The successor of Aloung Pra renewed the conflict and again drove the Siamese behind the walls of Ayuthia. A long siege followed, ending in 1765 with the destruction of the city, the death of the Siamese king, and the general break up of the kingdom.

Phaya Tak, a half-Chinese ex-official, having taken to the jungle on the fall of Ayuthia, raised an army and defeated the Burmese in occupation, made himself king in 1772, founded the capital of Bangkok, and in 1781 went mad and was dethroned. The people now chose as king Phaya Chakkri, a prominent war leader. The Burmese came on to the field again. Chakkri enticed the enemy far into the country, then cut off their supplies by removing the entire population, and, having starved the invaders attacked them with vigour and defeated them.

The remainder of Phaya Chakkri's reign was passed in consolidating his hold over the country, which he did in such a manner that when he died, in 1809, his son succeeded without opposition and passed his rather short reign in almost unbroken tranquility. On the demise of this ruler in 1825, a lesser

prince forestalled his brother, the rightful heir, by a stratagem, and, under the title of Phra Chao Prasat Tong, reigned 27 years. His popular name was Pra Nang Klao. He died in 1851, when the rightful heir, who had lived in retirement as a monk, succeeded under the title of ' Phra Paramindra Maha Mongkut '.

This is the person that was mentioned in my caption. He was born in 1804 A.D. as the eldest son of the Chief Queen of the king of Ayuthia, whose title was *Pañcagajaratana-sāmissarādhipati*. Known by the name of ' Makuṭasammatavaŋsa ', this prince, from his boyhood, was a pious person ; and having learnt the Dhamma and the Pali language in his youth, entered the Order when he was twenty. In entering the Order he chose the new sect of the Order which was recently founded by the monks of Rāmañña (= Lower Burma). The older sect which was called Mahānikāya, and the members of which wore the robe exposing one shoulder, was somewhat corrupted. The prince having no liking for them selected the new sect named *Dhammayuttika-nikāya*.

Since the ordination the prince was known by the name of Vajirañāṇa. Soon he became the Supreme Head of the Saṅgha of both sects and caused many reforms to be carried out among the community. Being a great scholar he compiled several books, among which is the *Sugatavidatthividhāna* written in Pali on the measurements given in the Vinaya.[1] He had many Sinhalese Elders as his friends with whom he corresponded freely until he had to leave the Order. A letter sent by him to the Anunāyaka of Hulava (of Kandy) contains the following beautiful verses which show his erudition and his own biographical sketch :—

1. 'Vīsādhiko suparipuṇṇavayo athāhaŋ
   mātāpitūhi anumānita-dhammanando
   ohāya ñātiparivaṭṭa-mahantakam pi
   hitvā ca kāmalalanāni anappakāni
2. uddissa naŋ sucira-nibbuta-lokanāthaŋ
   nikkhamma dhammavinayamhi paribbajanto
   Rāmaññathera-paṭipattiparamparāyaŋ
   pabbajjam eva upasampadam ādiyanto
3. Āciṇṇakappika-nikāyagaṇaŋ jigucchaŋ
   bhikkhūsu pabbajitabhāvagato idāni
   sikkhattayaŋ paripuremi yathākathañci
   āciṇṇakappika-nikāyagaṇaŋ pahāya '.

(= When I was over twenty I obtained the assent of my parents to enter the Order. Having left aside a multitude of relations and numerous pleasures

1. This book was printed in Ceylon with a Sinhalese translation by the Venerable C. A. Seelakkhandha, High-priest of Sailabimbārāma, Dodanduwa.

of sense, I left the world, following the Supreme Lord who had entered nibbāna long ago, and took orders of the discipline in the sect established by the Elders of Rāmañña. As I developed a dislike of the members of the old sect who adhered to traditional practices, I left them and entered the Order under the guidance of the Dhammayuttikas, and now I am observing the three modes of discipline).

There is another set of eight verses in Pali composed by this Supreme Elder in accordance with musical rhythm. I have the whole set with me, but I shall content myself by giving the transliteration here only of one verse as a specimen :

Nānā bhūri-sumedhāsīvisi medhāyaŋ dhanabhūrī nā
nānā thaŋ tarulīlāphullita-kāyā sobhitavedānā
nānā kānana-ajjhākārita gantvā pītapamā nānā
nānā vandita vande tam muni devindehi ca mānānā.

A letter sent from Siam to the Asgiriya Vihāra in Kandy contains the following paragraph in which mention is made of this Supreme Elder : *Sammāsambuddha-parinibbāṇato dvinnaṁ vassa-sahassānam upari sattasaṭṭhime vasse eko rājaputto tassa Paramadhammika-rañño vemātikabhātā Makuṭa-sammatavaṁsakumāro nāma paripuṇṇavīsativassakāle yeva pabbajitvā bhikkhu-bhāvappatto upasampannakāle Vajirañāṇo ti garūhi gahita-nāmadheyyo nāmadvayam upādāya ' Vajirañāṇa-makuṭasammatavaṁsatthero ti paññāyi,* (= Prince Makuṭasammatavaŋsa, who is a half-brother of the present king, Paramadhammika, entered the Order in 2367 B.E. at the age of twenty. When he received the higher ordination he was given the name Vajirañāṇa. So this Elder became known as *Vajirañāṇa-Makuṭasammatavaṁsa* by the combination of two epithets).

In a letter sent to the Venerable Bulatgama Sirisumanatissa of Paramānanda Vihāra, Galle, the king himself has stated how he was unwilling to accept the crown, and how he was forcibly disrobed by the chief ministers. In the same letter he has stated that it was not customary in Siam to address any letter to the king's person, but to a high dignitary. So the Elders of Ceylon should address letters to his Private Secretary. The following is the summary of his own description :—

Jeṭṭhādhipatinda-Paramadhammika-Rājādhirāja reigned for twenty-six years. When he was at the end of his life he wanted to hand the kingdom to his second son or the eighth. But the ministers and the public were against his wishes. Then he gave power of selection to three supreme dignitaries of the kingdom. The three dignitaries assembled those of the royal blood and the commons, who declared with one accord that the Supreme Elder Vajirañāṇa should be selected to the throne.

Then the chief ministers went to the monastery, Pavaranivesa, where the Elder was residing, and most respectfully requested him to accept the throne. As the Elder was unwilling, they stationed two thousand armed soldiers all around the monastery that the Elder might not escape from there. If he would not accept the throne there were several princes who would fight for it. So they got ready their own armies and the capital seemed as it was engaged in a war. After two weeks of this undertaking (i.e. surrounding of the Vihāra) the king died on the first day of the dark half of April. Early morning, next day, the king's treasurer, ministers Siri Suriyawaŋsa, Rājasubhāmati, and Sirivaḍḍhana, together with the brother princes of the Elder, came to the monastery, and with great pomp and ceremony conveyed the Supreme Elder to the Royal Palace. Then they deposited the king's body in a golden coffin and kept it with due respect in the palace named Rājavekusita.

After that they led the Elder to the image-house, named *Siriratana-mahābimba-paṭimāghara*, where the precious emerald image of the Buddha was kept. There they declared him king, and his younger brother to be the viceroy (= yuvarāja). After the declaration fifty-three princes who were directly descended from five former royal houses, more than one hundred princes of the royal blood, one thousand five hundred councillors and six ministers, rank by rank, bowed down before him and gave their oath of fidelity. After two days they disrobed the Elder and decking him with royal garments and insignia, led him to the Royal precincts and kept him in the Suraṭanakosa Palace. Now they began to make preparations for his coronation, and to provide every article that was needed for the purpose the government had to spend fifty crores (or 500 millions) of rupees. After the coronation his full name was *Varaparaminda-mahā-makuṭasammati-devavaṁsa-rājādhirāja.*

The Siamese name of this illustrious king was "Maha Mongkut". His reign of 27 years was peaceful and prosperous. It is interesting to read what has been written about this king by W. A. Graham in his book entitled *Siam: A Handbook.*[2]

'This king brought to affairs of state education and enlightenment in an unusual degree. A student of European customs, and efficient in the English language, his attitude towards foreign relations differed from that of his forebears. His reception of Sir John Bowring, the envoy sent by Great Britain to Siam in 1855, was highly favourable . . . Maha Mongkut strongly encouraged education and gave special care to that of his own children. He also did much to purify the national religion. Though strictly celibate up to the age of forty-seven years, he married

2. Taken from the *Peoples of All Nations*, Vol. VI, p. 4632.

a number of wives on becoming king, and when he died left about a hundred children . . .

'Mongkut died in 1868, and his son Chulalongkorn succeeded as a minor. The state was under a regency, but the king soon assumed full power. He reigned forty-two years and devoted himself solely to the interests of his country . . .

'Chulalongkorn visited Europe twice. He inaugurated military conscription, ports and telegraphs and railways, fostered education, and reformed the revenue, justice, police, and social systems. He died in 1910 deeply mourned, and was succeeded by his son Rama VI'.

A photograph of the King Maha Mongkut in his full attire and regalia, sent by him as a present to the Venerable Piyaratanatissa of Dodanduwa, is still to be seen there.

His son Chulalongkorn visited Ceylon on the 19th April, 1897, while he was sailing for England. He had brought many valuable offerings for the Tooth Relic, and when he visited Kandy the relic was exhibited to him. The king wanted to be blessed by the relic by taking it in his own hands, which the guardians of the Temple refused to allow. The king became exasperated and sent back all offerings to the Queen's Hotel, Kandy, where he had taken lodgings. Again he visited Ceylon on the 29th November of the same year, on his return home, but this time he spent the night in the steamer itself.

A. P. BUDDHADATTA

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Books Received

Sāhita Maga—An Approach to Literature (in Sinhalese). By Patrick J. Warnakula. Granthāloka Press, Hanwella, 1950; pp. 120; Rs. 2/-.

The author's attempt is to present a critical view of Sinhalese literature, employing for the purpose the 'principles' of English literary criticism. This tendency has led to the use of a large number of quotations *in English* from various writers on the subject and this has certainly made the book difficult, to say the least, to the average Sinhalese reader for whom alone a work like this has any significance. Apart from these obtrusive English citations, which are also marred by a number of misprints (e.g., pp. 8, 66), the Sinhalese style employed suffers from an undue 'modernism' which is apparent from the very first word 'Sāhita' (*sic !*) occurring in the title. This is obviously used for *sāhitya*, but in the form employed it is neither Sinhalese, nor Pali, nor Sanskrit !

Bauddha Lokaya. By Shāstrācārya Bambarende Siri Sīvalī Thera. Vidyālaṅkāra Press, Kelaṇiya, 1950; p. 427.

This is a revised and enlarged edition of the author's work on Buddhist Culture first published in 1948. It is an exhaustive treatise, and can well be regarded as a manual on the subject for students of Piriveṇas and Sinhalese schools. The author has made considerable use of the standard critical works on the subject in English, and in addition he has consulted the relevant literature in Sinhalese and Hindi. His style is easy and clear and the method of approach correct. This last trait is extremely valuable to the class of readers for whom the book is meant.

Saṅkhyā Prītiya, Book V. By D. F. E. Panagoda. The Associated Newspapers of Ceylon Ltd.

This is the fifth of the new series of Sinhalese Deskwork Books in Arithmetic prepared by Mr. Panagoda for the Primary Schools.

Bibliography of Scientific Publications of South Asia. No. 2 (July-December, 1949). No. 3 (January-December, 1950). Published by the UNESCO, South Asia. Science Co-operation Office, Delhi.

This journal gives a Bibliography of Scientific Periodicals as well as a list of Scientific Publications published in India, Burma and Ceylon.