Chapter Five

The techniques, plasters and pigments of the murals and the instruments of the painters

The canons of painting:

To be successful, a mural painter has to be a master artist, as well as a master technician jointly in the field. It is not enough that his work only fulfil and satisfy a certain standard of aesthetic judgement, it is necessary further that the work itself should be long lasting and durable. This clearly infers that both excellence and durability are the two fundamental qualities concomitant to each other in a work of mural painting of any period or tradition. Of these, the former is observable from their superficial appearances themselves and the latter quality is essentially dependent on effective technique. According to the description given in the previous chapters, it is evident that both these qualities have been well represented by the ancient Buddhist mural painters of India and Sri Lanka though natural elements and human vandalism have damaged their creations in the subsequent periods to a great extent. Of these, in fact a perfect technique is, no doubt, the result of a long period of experimentation in various methods and means, particularly in the ancient days.¹ Hence this aspect has to be examined very carefully and systematically though the relevant data is rare and often contradictory.

Thus, when considering the technical aspect of the early Buddhist mural paintings of India and Sri Lanka, it is evident that it has been studied from two perspectives: first, on
the basis of literary evidences available in the *śilpa* texts; and second, by a scientific examination of specimens of wall paintings. According to both these accounts, it is obvious that different, incompatible and sometimes even unacceptable opinions have been expressed on the techniques of paintings of both countries. For instance, as already mentioned in the previous chapter though there are no extant texts to provide information on Buddhist canons of paintings during the ancient period, some critics have applied the details given in the later Hindu canon to the Buddhist paintings of Ajanta too. Although it is difficult to ascertain the religious affiliation of these painters, it is certainly appropriate to believe that these painters were Buddhist *upāsakas* since they were deeply rooted in

5 The term ‘upāsaka’ is generally applied to people who spend considerable time and energy on Buddhist activities, whether in private rituals or organising support to the sangha. RF Gombrich, *Teravāda Buddhism*, Routledge and Kegan Paul, London, 1988, p.75; HP Ray, “Buddhism and trade in early historical India,”
Buddhist legends and teachings as discussed in the next two chapters in detail. But it is noteworthy that some critics have gone to the extent to state that the famous six limbs or \textit{Sadanga} rules given in the (13\textsuperscript{th} century AD) \textit{Commentary of Yasodhara on Kāmasūtra},\textsuperscript{6} the ‘eight limbs’ or \textit{Astangani} presumed in the (11\textsuperscript{th} century AD) \textit{Samarāṅgana Sūtradhāra}\textsuperscript{7} and the other ‘eight limbs’ or \textit{Gunāstaka} given in the \textit{Citrāṣūtra} section of the prominent Sanskrit text (of the 7\textsuperscript{th} century AD) \textit{Visnudharmottarapurāṇa}\textsuperscript{8} all of which were non-Buddhist canons as their names themselves suggest, have been followed not only by the painters of Ajanta but by the artists of Bagh caves too.\textsuperscript{9} Hence, at this point, it

\begin{itemize}
\item \textbf{Explorations in art and archeology of South Asia: Essays dedicated to NG Majumdar}, ed. Debala Mitra, Directorate of archaeology and museums, Government of West Bengal, Calcutta, 1996, p.551.
\end{itemize}
is necessary to focus attention on this matter and on the general contents of these non-Buddhist canonical texts.

As already stated, of these texts, the *Commentary of Yasodhara on Kamasutra*\(^\text{10}\) is undoubtedly not a Buddhist text in any sense. It contains information of erotic nature, which is incompatible with the ideals of Buddhist teachings. In addition, it is obvious that the dates of all the Buddhist mural paintings of both India and Sri Lanka of the ancient period are older than Yasodhara’s commentary. However, it is to be noted that it has been generally accepted that the *Sadangas* or the six limbs\(^\text{11}\) of the paintings thus presented in the commentary are: *rūpabhedā* (variety of form or the knowledge of appearances); *pramāṇam* (appropriate proportion or correct perception); *bhāva* (description of emotion or action of feelings on forms); *lāvanya yojanam* (infusion of grace or artistic

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\(\text{10}\) According to some scholars, Vatsyayana and Canakya happen to be one and the same person. Therefore Vatsyayana, the author of Kamasutra should be a person of the fourth century BC. Nevertheless, according to other scholars the *Kamasutra* was written in the third century AD. Certain Indian scholars have however tried to establish that the *Kamasutra* was written probably in the first century AD. See Anil Baran Ganguly, *Fine arts in ancient India*, Abhinav Publications, New Delhi, 1979, p.20. Thus it is evident that Vatsyayana’s date is uncertain though he appears to have been earlier than Kalidasa. Hence he is generally assigned to different periods from 3\(^\text{rd}\) century AD to the sixth. See Sures Chandra Banerji, *A companion to Sanskrit literature*, Motilal Banarsidass, Delhi, Second edition, 1989, p.104. However, it is certain that Yasodhara wrote the *Jayamangala commentary on the Kamasutra* of Vatsyayana under the Chālamāna king Visaladeva, middle of the 13\(^\text{th}\) century AD. Ibid, p.111.

\(\text{11}\) The verse reads: *Rūpabhedāḥ pramāṇāni bhāvalāvayayojanam/* Sādṛṣyam varnikābhhangam iti citram saṅdakakam // *Yasodhara’s commentary on the Kāmasūtra*, part I, chapter 3: as quoted by Asok K Bhattacharya, *Technique of Indian painting: A study chiefly made based on silpa texts*, Saraswat Library, Calcutta, 1976, Introduction, pp.14 and 29. Although Tagore has presented a detailed account of the six limbs given in the Kamasutra (Abanindranath Tagore, “Sadanga or the six limbs of painting,” *Journal of the Indian Society of Oriental Art*, Calcutta, 1961; *Some notes on Indian aesthetic anatomy and Sadanga* or the six limbs of painting, *Indian Society of Oriental Art*, Calcutta, (reprinted) 1968, pp.1-18), Coomaraswamy pointed out that it is impossible to accept his subjective interpretation of these terms. According to him, these can be far better understood in a purely practical sense as distinction of types; ideal proportion, expression of mode (with reference to rasa) and preparation of colours (grinding and levitation etc). See AK Coomaraswamy, *History of Indian and Indonesian art*, Munshiram Manoharlal, New Delhi, (reprinted) 1972, p.88.

Accordingly, it is obvious that these six limbs indicate an insight into what should be the qualities of a good painting and influenced the formation of style. The description is, however, too general and therefore it can be applicable to any tradition of painting including the Buddhist tradition, except perhaps the monochrome and modern idealistic painting traditions. This is further substantiated by the fact that the ancient Chinese artists have also used a similar Šadanga cannon. As some scholars have pointed out, these six canons of Chinese painting of Hsieh-Ho (479-501) closely follow the six limbs of Indian painting, though the order of classification is somewhat different. These are: (1) mental revolution gives birth to the life rhythm; (2) to bring out the anatomical structure with the help of the brush; (3) to draw forms in conformity with nature; (4) to make the colours correspond to the nature of the object; (5) to distribute the lines in their proper places; (6) to propagate the forms by passing them on into the pictures. As also stated by Coomaraswamy, any parallel to the Chinese six canons of Hsieh Ho cannot be traced though a likeness to the Chinese idea, but can probably be recognised in connection with


what is said about cetana, the movement of life, in the Visnudharmottara-purana.\textsuperscript{16} Accordingly, it is evident that these six limbs of painting in Chinese seem to have similarities with the Brahmanical tradition but have been reinterpreted to suit Chinese exigencies.\textsuperscript{17} Hence it is obvious that an overall comparison of the Indian concept of ‘Sadanga’ with the six limbs theory of the Chinese pictorial art is not possible.

Of the Indian silpa texts, the most famous one on painting is the Visnudharmottara of the seventh century AD, which was a supplement or appendix to the Visnupurana.\textsuperscript{18} This manuscript gives the fullest account known of the various branches, methods and ideals of Indian painting. It deals not only with its religious aspects but also and largely with its secular employment.\textsuperscript{19} It proclaims the joy that colours, forms and the representation of things seen and imagined produce.\textsuperscript{20} It is noteworthy that though Madhusudan and Madhava Prasad Sharma edited this Visnudharmottara Mahapurana in 1912,\textsuperscript{21} discussions on painting proper, with reference to Indian silpa texts was, for all practical purposes, started by Gopinath Rao.\textsuperscript{22} This was followed by the English translation of the Citrasutra and Pratimalaksana sections of the Visnudharmottara by

\textsuperscript{15} Ibid, p.242.
\textsuperscript{16} AK Coomaraswamy, History of Indian and Indonesian art, Munshiram Manoharlal, New Delhi, (reprinted) 1972, p.88.
\textsuperscript{18} Stella Kramrisch, Exploring India's sacred art: Selected writings of Stella Kramrisch, ed. Barbara Stoler Miller, Indira Gandhi National Centre for the Arts, New Delhi, 1983, p.263; C Sivaramamurti, Chitrasutra of the Vishnudharmottara, Kanak Publications, New Delhi, chap.1, pp.1-16.
\textsuperscript{20} Stella Kramrisch, Exploring India’s sacred art: Selected writings of Stella Kramrisch, ed. Barbara Stoler Miller, Indira Gandhi National Centre for the Arts, New Delhi, 1983, p.263.
\textsuperscript{21} Madhusudan and Madhava Prasad Sharma, Visnudharmottara Mahapurana, Venkateshwara Press, Bombay, 1912.
Stella Kramrisch.\(^{23}\) This translation along with an illuminating introductory note attracted the attention of many scholars working on Indian art. Consequently, Coomaraswamy also published an annotated version of only chapter 41 of the *Visnudharmottara*.\(^{24}\) In order to improve Kramrisch’s translation and to provide an overall understanding of the treatise with the help of other references and documents. Nevertheless, he experienced difficulties in the study of the text and he frankly admitted that in spite of his best efforts he could not solve all the problems related to the technical terms even with the help of the other experts.

Both these scholars, Kramrisch and Coomaraswamy worked mainly on the early edition of the text done by Madhusudan and Madhava Prasad Sharma. A scrutiny of this printed work apparently reveals frequent corrupt readings. Certainly, for this corrupt condition of the text and for a general difficulty in understanding the technical terms and the conceptions of the ancient Indian painters, many problems relating to the proper appreciation of the subject dealt with in the text had to be left unsolved by them.\(^{25}\) Hence, the importance of the subsequent Priyabala Shah edition lies in the fact that the author prepared the text with the help of a collated study of at least seven manuscripts, in addition to the above-mentioned earlier text published by the Venkateswara Press.\(^{26}\) Nevertheless,


by the very nature of the study this editor too frankly admits that in spite of the efforts made by her to present a correct text, it cannot be said that it gives complete satisfaction. 27

The Visnudharmottara is generally divided into three major parts. Of these, the first part discusses the creation of the world, geography, astronomy etc. The second part deals with Dharma, Rajaniti and polity. The third part or the Citrasutra contains short treatises on Sanskrit and Prakrit grammar, lexicology, metrics, poetics, dancing, singing, instrumental music and long treatises on painting, icono-plastic art and architecture. This Citrasutra has been discussed in nine chapters from 35 to 43 of the Visnudharmottara. Of these, chapter 40, named as ‘Rangavyatikāra,’ specially deals with the techniques of preparing the ground for the wall painting, the first sketching and the preparation of various shades of colours etc. There is ample evidence to show that the author of the text had an exceptional insight into the intricate problems involved in the making of a painting of high order. This is evident from the discussion of the Gunastakas. The Visnudharmottarapurana says that proper position, proportion and spacing, gracefulness and articulation, resemblance, decrease and increase are the eight good qualities of a painting. 28 It not only prescribes these laws regarding the human form of various types and categories and their proportions, but also deals with the problem of foreshortening or kṣayavṛuddhi. Certainly, this discussion on the law of foreshortening is a unique contribution of the text, for this topic has not been specifically treated in any other silpa text. 29

27 Ibid, p.xviii.
It is however difficult to say how far the theory of painting preserved in the Citrasutra of Visnudharmottara served as a practical guide to even Hindu painters. It is also not easy to correlate the theory with practice as the surviving examples of paintings except in some cases hardly follow the rules laid down by the author of the Visnudharmottara. For instance, the difference between theory and practice is apparent in the elaborate formula for preparing the wall surface for painting in the Visnudharmottara as opposed to the simple formula of earth mixed with cow dung and chaff pressed into the surface at Ajanta as discussed below. It is also evident that the Visnudharmottara formula was meant for the smooth surface of a structural temple and not for the rough surface of a cave like Ajanta or Bagh. In addition, in the colour shades too the theory is much more advanced than the practice. For instance, the use of gold, silver, copper, mica, ultramarine, orpiment, minium, cinnabar etc shows an advanced knowledge of additional colours that contrasts with the limited palette of Ajanta and Bagh paintings.

Apart from these evidences, it is generally accepted that the chapters of the Visnudharmottara dealing with painting must have been compiled in the seventh century AD, most probably later than the latest paintings of Ajanta; and so we are acquainted with the theories prevalent at the time of the full maturity of their practice. Similarly, it is

34 Stella Kramrisch, Exploring India's sacred art: Selected writings of Stella Kramrisch, ed. Barbara Stoler Miller, Indira Gandhi National Centre for the Arts, New Delhi, 1983, p.264. Coomaraswamy and Mulk Raj also believe that the manuscript of Visnudharmottara belong to the seventh century AD. See Ananda K Coomaraswamy, “The technique and theory of Indian painting,” Technical studies in the field of fine arts.
obvious that while enumerating the defects and virtues of painting the author of the Visnudharmottara acted as a critic of the contemporary style of painters. In this process, apparently, the author shows his partiality for the older tradition surviving in the paintings of Ajanta and Bagh in which right stance, right proportion, vertical composition, modelling, and foreshortening are pronounced features. According to all these facts, it is very doubtful whether the Buddhist painters of Ajanta and Bagh caves have used this text as their guide or handbook as believed by some scholars.

Together with the Visnudharmottarapurana, mentioned above, some scholars suggest that the painters of Ajanta and Bagh caves used some of the rules of paintings given in the Samarangana Sūtradhāra also. In any case, first, it has to be admitted that among the other canons besides the Visnudharmottarapurana, the Samarangana Sūtradhāra is acclaimed as one of the most valued silpa texts. This canon is primarily a work on architecture and painting and icono-plastic art are dealt with in chapters 71 to 82. Ganapati Sastri edited the text on the basis of three available manuscripts in the 1920s. But only one of them, which belongs to the Baroda central library, contains a discussion on painting. Apparently, the section on paintings, which is also mutilated and corrupt in its present state, has thus been edited on the basis of a single manuscript, leaving no scope for improvement by a comparison of various readings as in other cases.

Fogg Art Museum, Harvard University, Vol.III, No.2, October 1934; Mulk Raj Anand, The Hindu views of art. Arnold-Heinemann, New Delhi, 1957, p.107; Priyabala shah also believes that the text should be placed between 450-650 AD. See Priyabala Shah, Visnudharmottara-purana (Khandha III), Vol.I, Gaekwad’s Oriental Series, No.130, Baroda, 1958, p.xxvi; Nevertheless Nagpall believes that this is belong to the sixth century AD. JC Nagpall, Mural paintings in India, Gain Publishing House, Delhi, 1988, p.3.

However, it is said to have been written by king Bhoja of Dhara (c. 1000-1055 AD) of the Paramara dynasty. Therefore, it is clear that the descriptions of painting methods and formulas of ingredients given by the author of *Samarāṅganā Sūtradhāra* cannot be applied to the murals of Ajanta or Bagh or any Buddhist wall painting site of ancient India, since these paintings were earlier than the canon by a few centuries, as in the case of the descriptions given in Yasodhara’s commentary on *Kāmasutra*. Although it is needless to discuss this matter further, it is noteworthy that the most valuable contribution of the *Samarāṅganā Sūtradhāra* appears to be the discussion of ‘eight limbs,’ which are eight successive stages in the making of a meritorious painting. In fact, the importance of these eight limbs cannot be over-estimated, for with their help the entire procedure involved in producing a mural in Indian technique can be explained. Accordingly, it seems that while the well-known six-limbs or *Sadāṅga* of painting referred to by Yasodhara, the commentator of the *Kāmasutra* and the eight qualities or ‘*gūnāstaka*’ of the *Visnudharmottara* enumerate the aesthetic virtues of painting, these eight limbs or the ‘*astāṅgāni*’ of the *Samarāṅganā Sūtradhāra* enjoin the technical steps essential in particular for wall painting.

39 For the detailed account of these six limbs refer to Abanindranath Tagore, “‘Sadāṅga or the six limbs of painting,’” *Journal of the Indian Society of Oriental Art*, Calcutta, 1961; *Some notes on Indian aesthetic anatomy and Sadāṅga or the six limbs of painting*, Indian Society of Oriental Art, Calcutta, (reprinted) 1968, pp.1-18; See also Phanindra Nath Bose, *Principles of Indian silpastra with the text of Mayasastra*, The Panjab Sanskrit Book Department, Lahore, 1926, p.84; Sri Aurobindo, *The significance of Indian art*, Sri Aurobindo Circle, Bombay, 1947, pp.84-95.
41 The verses read; Vartikā (pra) thamam teśam dvitiyam bhūmbandhanam/ Lekhyam triyam syād rekhaśkarāni (vartatemīha laksanam ?)
According to the short description thus given above, it is apparent that these canons of paintings contain rules of Indian paintings covering a long period, at least from

Pancamāni (karsakarmacca?) sastham sāyād vartanākramah/

Nevertheless, Bhattacharya reasonably rejected these and has given another interpretation. Please refer to Asok K Bhattacharya, Technique of Indian painting: A study chiefly made based on silpa texts, Saraswat Library, Calcutta, 1976, Introduction, pp. 92-97.

42 Besides Samaratana Sutradhara, regarding few other canons of paintings, which also belong to non-Buddhist tradition, please refer to PA Mankad, Aparatiipraacai, Gaekwad’s Oriental Series, No. CXV, Baroda, 1950. Although this is an exposition of the science of architecture, other arts like astrology and music etc have also been discussed. Among them, few chapters on the icono-plastic art and painting also included. Abhilasitiirtha Cintāmanī or Manasālīsā, ed. GK Shrigondekar, Gaekwad’s Oriental Series, No. LXXXIV, Baroda, 2 vols. 1939; Abhilasitiirtha Cintāmanī, ed. R. Shama Sastry, University of Mysore Sanskrit Series, No. 69, 1926; See also AK Coomaraswamy, “The technique and theory of Indian painting,” Technical studies in the field of fine arts, Fogg Art Museum, Harvard University, Vol. III, No. 2, 1934. The authorship of the book has been attributed to the Western Chalukya king Someswara ostensibly Somadeva III (first part of the 12th century AD) in the colophon of the text. The third part, which contains a group of 20 chapters, deals with architecture, painting, iconography etc. It appears that the Manasālīsā was the earliest among the Silpa texts describing the pictorial tradition in South India. (Asok K Bhattacharya, Technique of Indian painting: A study chiefly made based on silpa texts, Saraswat Library, Calcutta, 1976, Introduction, p. 18); See DN Shukla, Silpa sastra: Hindu achievements in aeronautics and fine arts, Shri Darshan Ila Vastuvammya Prakasha-sala, Lucknow, 1967, pp. 63-65. Silaparatna is also another important text on painting. Chapter 46 of the Silaparatna is entitled Citralaksana or the characteristics of painting. The manuscript has been edited by T Ganapati Sastry, Trivendrum Sanskrit Series, No. 75, 2 vols. 1922.

Subsequently an introductory note of the Citralaksana section i.e. chapter 46 of the Silaparatna by KP Jayaswal appeared only with the terminological meaning of certain words used in the chapter. KP Jayaswal, “A Hindu text on painting,” Journal of the Bihar and Orissa Research Society, Patna, Vol. IX, 1923, pp. 30-39. Thereafter a translation of chap. 46 of the text by Coomaraswamy was published in Sir Asutosh Memorial volume. See AK Coomaraswamy, “Citralaksana,” Sir Asutosh Memorial Volume, Patna, 1926-28, pp. 49-61. The author of this manuscript was Sri Kumara. However, the Silaparatna being the latest among the major Silpa texts, offers a comparatively dependable reading and from the comprehensive character of the book it would not be an exaggeration to say that this chapter of the Silaparatna could have been a useful source for the study of the technique of Indian painting, so far as the tradition of South India is concerned. Asok K Bhattacharya, Technique of Indian painting: A study chiefly made based on silpa texts, Saraswat Library, Calcutta, 1976, Introduction, p. 20; Jayanta Chakrabarti, Techniques in Indian mural paintings, Calcutta, 1980, p. 4; AK Coomaraswamy, “Citralaksana,” Sir Asutosh Memorial Volume, Patna, 1926-27, p. 54. The manuscript of Nāradaśilpaśāstra is also another important work. V Raghavan, “Two chapters on paintings in the Nāradaśilpaśāstra,” Journal of the Indian Society of Oriental Arts, Calcutta, Vol. IV, 1936. In chapters 60 to 66 of Nāradaśilpaśāstra the manuscript discusses the construction of some special types of painting galleries. Moreover, it describes the laws of beautification of buildings with paintings. Nevertheless, compared to the Visnudharmottara and the other former manuscripts Nāradaśilpaśāstra contains scanty information on painting. From the external evidence it is almost certain that Nāradaśilpaśāstra represents the tradition of South India and belongs to a later date. However, it is evident that the reading of the text is difficult and full of problems. See Asok K Bhattacharya, Technique of Indian painting: A study chiefly made based on silpa texts, Saraswat Library, Calcutta, 1976, Introduction, p. 23; See also Jayanta Chakrabarti, Techniques in Indian mural paintings, Calcutta, 1980, p. 21: Balram Srivatava, Notes of Indian aesthetics (with special reference to silpa), Chaukhamba Oriental Research Studies, No. 33, Chaukhambha Orientalia, Varanasi, 1985, pp. 107-131. The Sudhalepavidhana, another booklet of only 46 slokas, dealing with mural painting, is also found to be one containing useful information. See VV Sharma, “Method of plastering wall for painting (Sudhalepavidhana),” The Indian
the sixth or seventh century AD onwards. Within this long period, it is obvious that there were different traditions of the *silpa sastra* works in India of which the two well known were the traditions of the south and the north. Of such various canons, without doubt the *Visnudharmottarapurana* and the *Samarāngana Sūtradhāra* belong to the north Indian tradition while others belong to the south Indian institution. But, in a wider context a study of these texts, particularly the sections on paintings, reveals that in spite of their apparent differences, there is a common approach to the subject. Nevertheless, it is evident that the northern tradition of painting, as represented in the *silpa* texts has not survived though a few examples of the southern tradition can still be found in the south Indian region.

Although it is obvious that the Buddhist paintings of Ajanta and Bagh are different from the descriptions given in the *silpa* cannon so far discussed, it is worth indicating the magnitude of the problems involved in the study of extant *silpa* texts. Damage and mutilations of the manuscripts, sometimes in important sections, constitute a serious handicap. In addition, copyists’ errors are particularly problematic in the identification of the technical words in their original forms. It is also obvious that the texts come from different regions of the vast Indian sub-continent and as such contain certain technical terms coined by regional artists. Another difficulty with *silpa* texts is that some of the technical instructions were put down in sutra form, which without any explanatory commentary by one who knows, remain vague, obscure and inadequate. Therefore, it is

*Historical Quarterly*, Vol.III, No.1, 1927. It seems that the concise text was written after the *Silparatna* and most of the instructions of the *Silparatna* related to the method of plastering are briefly but systematically stated in this text. Jayanta Chakrabarti, *Techniques in Indian mural painting*, KP Bagchi and co, Calcutta, 1980, p.11.


not without reason, that Coomaraswamy observes that the mastery of *silpa* texts will have to be acquired gradually: existing dictionaries offer little aid and often worse than none.\(^{46}\)

In addition, it is highly probable that practising or professional artists did not write most of the Indian *silpa* texts. The authorships of *Samarangana Sutradhara* and *Abhilasitārtha Cintāmani* or *Mānasollāsa*, which have been assigned to king Bhoja of Paramara dynasty and Western Chalukya king Someswara respectively, are best examples in this regard. Similarly, poets who possibly had some association with the artists and were commissioned by the rich patrons to write such texts.\(^{47}\) Hence, it is obvious that mere observation and enquiry by such non-professionals were bound to have certain limitations. It was impossible for them to go deep into the minute details of the technical processes in each and every phase of execution of a painting. This is particularly evident from the fact that a trite inadequate formula is often repeatedly prescribed for different categories of painting, as if it was equally applicable to all. For example, there are no separate lists of colours for tempera or fresco painting on canvas, palm leaf and for mural painting etc. In fact, it is obvious that all the colours mentioned in the list can never be used in a mural painting alone. No doubt only limited colours, like yellow ochre, red ochre, lapis lazuli, terre verte, black (carbon), lime or kaolin etc which are lime resistant and not sensitive to alkalis can be used in mural paintings, since lime


is used as an ingredient for plaster and for either prime coat or both prime and subsequent coats in Indian murals.\(^{48}\)

However, besides these Indian texts, no indication whatsoever exists that the ancient Sri Lankan artists followed detailed complex prescriptions similar to those followed by the non-Buddhist painters of India.\(^{49}\) But, it is noteworthy that there is a large volume of unpublished information mainly confined to ola-leaf manuscripts, having as their subject matter architecture, sculpture, painting and other minor arts and crafts though scholars in Sri Lanka have rarely been inclined to pursue studies connected with these aspects.\(^{50}\) Many such handbooks of medieval and late medieval periods have been found particularly in various family collections and libraries but have little to contribute on the ancient tradition.\(^{51}\) However, as in the case of the Indian canons it is evident that many of these works on \textit{silpa sastras} of the island too are in Sanskrit, of a corrupt nature, followed by paraphrases in Sinhalese. For instance, the art canon of the Sri Lankan painters of the medieval period is a work named \textit{Rupavaliya}, which is also in the same form and language. According to Coomaraswamy it is a work of Brahmanical origin datable to about 11\(^{th}\) century AD\(^{52}\) and its contents were summarised by him as consisting in the main of the iconographic characteristics of various gods and some ornamental devices, which were known to sculptors and painters.\(^{53}\) In addition, there are a few other

\(^{48}\) Ibid, p.17.
\(^{51}\) Nandadeva Wijesekara, Early Sinhalese painting, Saman Press, Maharagama, 1959, p.77.
\(^{53}\) Ibid, pp.111-113.
unpublished manuscripts dealing directly with the subject of painting, but they too belong to the medieval and late medieval periods.\(^{54}\)

According to this short description, though it is clear that nothing remains of precise *silpa* canons of the Buddhist painters of Sri Lanka of the ancient period, there is no evidence to suggest as some scholars have done that the ancient painters of the island have also used some of the Indian canons like *Visnudharmottarapurana*, *Samarangana Sutradhara* and some other still later non-Buddhist regulations.\(^{55}\) Some writers have incorrectly gone to the extent to state that the Buddhist painters of Sri Lanka have used the six limbs given in the Commentary on the Kamasutra too.\(^{56}\) Hence, it is obvious that when examining the techniques of ancient Buddhist mural painting traditions of India and Sri Lanka the most suitable way is to rely upon the information obtainable from scientific researches and the close examination of the extant paintings rather than on details given in the canonical texts. Nevertheless, it should not be forgotten that there are some limitations in relating to the scientific researches too. For instance, if the plasters of paintings survived for a period of more than thousand years, there may have been decomposition of the organic material and occurrence of chemical and physical changes in the ingredients.

\(^{54}\) For further details of these manuscripts please refer to M. Somathilake, *A historical study of mural paintings in Buddhist temples during the 18\(^{th}\) and 19\(^{th}\) centuries of Sri Lanka*, Unpublished MA dissertation, University of Peradeniya, 1996, fifth chapter.


Therefore, even modern science would also not be able to reveal the original ingredients correctly as in the case of the formulas given in the *silpa* canons.57

**The support and the ground of the paintings:**

As discussed in the third and fourth chapters in detail, most of the Buddhist mural paintings of India and Sri Lanka were either in cave temples, brick-built temples or structural stupas. Hence, it is essential to focus attention at this point, at least briefly, on architectural forms and the special characteristics of these monumental structures also. For example, the caves of Ajanta fall into two distinct groups separated from each other by a fairly long interval, the first belonging to the second century BC and the second, to the fifth or sixth century AD. There are altogether at Ajanta, including the unfinished ones, a total of thirty-one caves, of which cave nos 9, 10, 19, 26 and 29 are *caityagrihas* and the rest of the caves are monasteries. Of these, the earliest caves at Ajanta are the *caitya* halls no 9 and 10 and the *viharas* no12 and 13. Of the *caitya* halls at Ajanta, cave no 10 is considered the oldest and chronologically it follows the *caitya* halls of Bhaja and Kondane. Hence, its architectural forms are more highly developed than those of the earlier *caitya* halls, particularly the spring of the horseshoe arch on the façade.58 Whereas the façade screen of cave no 10 is carved in wood and the pillars of the nave slant inward, as they would if the structure were of wood and thrust of the roof had to be counteracted, he (the artist) converts his imaginary picture into a material picture, in accordance with the six-fold principles, such as iconography, size, colours etc.” Ibid, p.65.


58 For further details of architectural evolution of these early caitya halls and viharas see Percy Brown, *Indian architecture. (Buddhist and Hindu periods)*, DB Taraporevala and sons, Bombay, 3rd ed, (n.d), pp.25-30.
the façade of cave no 9 was executed in stone and pillars are perpendicular. An interesting feature of cave no 9, reflected in the later plan of the Vihara shrine, is that the end is flat rather than apsidal. However, these caitya caves are internally divided by colonnades into a central nave, an apse and side-aisles, the latter continuing behind the apse and thus, providing for circumambulation. In the second phase of excavation, the general layout of the monasteries was standardized, though each one of them continued to present some individual features. At this stage a shrine with a colossal image of Buddha was introduced in the middle of the back wall of the pillared hall opposite the entrance-door. The shrine has in many caves an antechamber in front. Sometimes there are subsidiary shrines in the back and sidewalls. It is generally believed that the rock cut viharas at Ajanta as elsewhere were intended as residential quarters only, since they consisted of an astylar hall surrounded by a series of cells, small square or rectangular chambers cut further into the rock.

The method adopted in Ajanta rock-hewn temples was followed in the caves of Bagh too although differently designed in detail. Consequently, the general plan of the caves at Bagh was the same as the other caves, but these are on a far bigger scale than the caves of Ajanta. The general scheme consists of a main central hall with cells for meditation all round and a main shrine with a stupa as the chief place of worship. Another similar set of caves are at Ellora. Like the Buddhist caves of Ajanta, these follow certain layout patterns that are common to caityas and viharas, but show certain definite stylistic differences in the architectural elements. This is reflected in the

pillar types, niche forms and prevalent plinth mouldings etc. This difference is at once corroborated by the iconography of the two cave groups, since Ellora is demonstrably shown as quite evolved and tending to be nearer the Vajrayana. 62

It would be of interest to discuss the process of excavating these caves as evident from the unfinished floor and columns of cave nos. 24 and 25 at Ajanta. 63 This process, commenced after the outline had been marked and excavation started from the ceiling that was finished first. The work then continued downwards by the cutting of deep alleys with sharp and heavy instruments like the pickaxe followed by the breaking of the intervening ridges, leaving solid blocks, for pillars where necessary, till the floor was reached which was the last to receive attention. The preliminary work of excavation was thus done by pickaxe and the rest, including the finish and carving was entirely executed by hammer and chisel. According to the method of excavation, after finishing the façade and the veranda the excavator went deep into the interior, attending first to the hall and next taking up the antechamber, shrine or cells as the case may be, the procedure of the excavation being the same. 64 Thus, it is clear that the caves were not only hewn out from top to bottom vertically but also from front to back. Accordingly, one can observe that the rock-cut architecture of the Indian painting sites is considerably different from the method of construction of structural monuments. In addition, it is interesting to note that the work

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of quarrying, dressing and finishing of Buddhist caves presumably went hand in hand. This is particularly evident from the fact that even the unfinished caves of Ajanta bear traces of paintings. Hence, it would seem that plastering and painting was also taken in hand immediately and simultaneously, with the excavation of the caves. For example, in cave no 4 at Ajanta, the carvings on the pillar are unfinished, but the paintings on the ceilings are complete. Therefore, as evident from Ajanta, it may be presumed that the chisel-work and brushwork of paintings at the mural sites of India proceeded simultaneously.

According to the method of excavation thus described, the outer surface of the inner walls of the caves, cut into the hard and compact volcanic trap-rock or basalt, characterised by vesicle and amygdaloidal cavities, constituted the carrier for the plaster on which the pigments were laid. Thus it is obvious that the surface of the carrier was rough and uneven, with deep furrows and chisel-marks produced in the course of excavation of the caves by the slow process of hammer and chisel strokes. Indeed, this itself was an advantage, as a tooth was provided to the plaster laid on the surface. Thus, at Ajanta, at least three types of rock surfaces were made, i.e. the most uneven, moderately uneven and even surfaces. Of these, the most uneven surface can be seen on the ceilings and walls of the cells in the viharas. Particularly, the rough surface of the ceiling with deep chisel-marks was made to hold firmly in strong bond the hanging plastered grounds, so that it did not crumble easily. Moderately uneven surfaces were made on the vertical sidewalls and front walls of most of the vihara halls of the fifth or the sixth century AD.

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The third type was used to bring out details of ornamental pillars, for which a very high degree of evenness of surface was felt necessary. Besides these later caves where at least three kinds of rock surfaces can be seen, it is noteworthy that the wall surfaces of the early cave nos 9 and 10 at Ajanta were more evenly chiselled. These general descriptions of the method of excavation and also the making of walls particularly of the later caves of Ajanta are directly applicable to the method of digging out the caves of Bagh, Ellora and Aurangabad too.

In contrast to India where Buddhist paintings now survive only in the rock-hewn cave temples, at least two categories of places are known where the painters of ancient Sri Lanka drew Buddhist murals. These are the natural rock caves or rock surfaces and the constructed walls of the shrines or the walls of relic chambers of the stupas. In the case of a cave or a rock, a technique of deepening a rock shelter or cave was developed by 'peeling off' the weathered surface and striated layers of the rock to form a deep cavity or declivity below a large natural boulder or projecting cliff-face. Meanwhile, a deeply incised groove or drip-ledge, running in a horizontal line as far as permissible marked the upper limits of the peeled surface, which further protected the cavity thus formed. In fact, this drip-ledge quite effectively prevented rainwater flowing down the sides of the boulder or cliff, into the depression. Consequently, this device helped to keep the surface where the paintings were executed dry, the water being directed to flow down the drip ledge vertically beyond the limits of the mouth of the cave.

68 Nandadeva Wijesekara, Early Sinhalese painting, Saman Press, Maharagama, 1959, pp.77-78.
Besides, in most cases, the area to be utilised for paintings having been so selected in the cave was enclosed and enlarged by the addition of frontal screens of walls—originally made of mud and wattle or rubble, later of brick or stone masonry and surmounted by a lean to roof to form a cave shrine. However, an even surface was ultimately obtained by plaining away the irregularities on the rock face. Subsequently, as in the case of the rock cut caves of India, the surface was converted into a series of tiny pittings by means of a pointed iron instrument, to ensure substantial adhesion of the overlying plaster to become one composite structure with the rock. The rock face thus plastered and smoothed was finally covered with paintings.

According to this short description, one major difference is clearly evident between the cave temples of ancient India and Sri Lanka where the paintings still remain. Primarily, the Indian paintings have been located in edifices chiselled out of the living body of the rock. This method of carving out buildings from massive rocks is lacking in Sri Lankan painting sites. Hence, the question arises at this point: why did the Sri Lankans deviate from the practice thus accepted in India? It is obvious that the quality of rock in Sri Lanka differed to make it a burden to excavate buildings out of it, since it was too hard and strong unlike the case of Ajanta, Bagh, Ellora etc. Another aspect of this issue is the suggestion that the Indian paintings served the needs of a few residents within an area or a temple itself whereas in Sri Lanka these were presented to a wider congregation. For instance, Dehejia concludes that it is a distinct probability that Ajanta’s painted narratives

70 Nandadeva Wijesekara, Early Sinhalese painting, Saman Press, Maharagama, 1959, p.78.
were not intended exclusively or even primarily for public viewing. In view of their location within residential temples, it is plausible that the murals were to be experienced by the monastic community of Ajanta and further stressed that the narratives may have been addressed to the resident monastics with the intention that they benefit from the Buddhist message of the tales. For example, contemplating on the fortitude displayed by ascetic Khsantivadin who, when his limbs were torn apart, only blessed the king who passed the order, may have served as an inspiration to the Ajanta monks and facilitated their spiritual advancement.\footnote{Vidyā Dehejia, Discourse in early Buddhist art: Visual narratives of India, Munshiram Manoharlal Publishers, New Delhi, 1997, p.34.} In this context, it is to be noted that some scholars have concluded that Ajanta was a centre of Buddhist education\footnote{Shobhana Gokhale, “Ajanta: The centre of monastic education,” The art of Ajanta: New perspectives, ed. Ratan Parimoo and others, Books and Books, New Delhi, Vol.1, 1991, p.149.} as discussed in the third and seventh chapters in detail. This may be equally applicable to the painting sites of Bagh and Ellora too as their massive architectural elements suggest.

Besides these rock surfaces, the second variety of surfaces where paintings are available in Sri Lanka, but not in India are the brick walls of a shrine as in the case of Tivamka image house and the walls of the relic chambers of various stupas. It was found that these painted walls of Sri Lanka were constructed using different materials and techniques. Consolidated mud walls, stone walls in mud mortar, laterite in mud mortar and burnt bricks in mud mortar are some of the clay-based techniques used in constructing walls, while brick in lime mortar, stone in lime mortar are some of the lime bindings used in wall constructions. It is evident that all these walls were plastered using
either clay mortar or lime mortar before decorating them with paintings.\footnote{Nimal de Silva, “Studies in the techniques of ancient paintings in Sri Lanka,” Perspectives in archaeology: Leelamanda Prematilaka festchrift 1990, ed. S Senaviratna and others, Department of Archaeology, University of Peradeniya, 1990, p.128.} It is noteworthy that unlike the ordinary brick walls of a shrine thus described, there were several enclosures of the relic chambers of the larger stupas. Usually three compartments were located one above the other in the centre of a solid mass of brick masonry, which formed the dome and basal terraces of the stupa. These chambers generally served as repositories for the relics, which signified the presence of the Buddha within the monument along with other valuable things. The chambers were embedded in the masonry and totally inaccessible after completion of the construction.\footnote{Senaka Bandaranayake, The rock and wall paintings of Sri Lanka, Lake House Bookshop, Colombo, 1986, p.74.} Therefore, as also mentioned in the third chapter, the paintings thus executed were actually never viewed once the monument was completed. Hence no doubt that these were part of the ritual apparatus that activated the symbolic meaning of the chambers and their contents.

It is evident that plastering the walls of such buildings or stupas or caves for executing paintings during the ancient period of both countries was not an ordinary method, generally adopted for the customary houses.\footnote{For the description of methods of plastering buildings in ancient India, see Stella Kramrisch, “Plaster,” BC Law Volume, ed. DR Bhandarkar and others, The Indian Research Institute, Calcutta, Part I, 1945, pp.611-616; VV Sharma, “Method of plastering walls for painting (Sudhalepavidhanam),” The Indian Historical Quarterly, Vol.III, No.1, 1927, pp.53-59. This article discusses the descriptions of plastering methods given in an ancient Indian manuscript that belong to the Hindu tradition.} In the Buddhist wall paintings of India, the process of execution of the murals appear to have been the same in all the examples that have survived, according to Brown’s interpretation.\footnote{Percy Brown, Indian painting, YMCA Publishing House, London, 1927, p.112. He describes that over the surface of the rough excavated wall of rock, a mixture of clay, cow-dung and pulverised trap rock was applied, to the thickness of one-eighth to three-quarters of an inch. Sometimes this first dressing also contained finely chopped straw or rice husks. This ground was then coated with an exceedingly thin layer of...} Nevertheless,
different opinions have been expressed on the subject of the preparation of plaster and the contents or ingredients that were used by the Buddhist painters of India during the ancient period, (especially in relation to Ajanta) by other scholars like Coomaraswamy, Nagpall, Craven, Debala Mitra and Rowland etc.

But, unlike these earlier scholars, Lal outlined the actual ground of the painting of Ajanta in detail in 1960s. According to him the laying of ground can generally be described as constituting of three layers: the pigments; fine plaster; and coarse plaster with two distinct lines of junctions which have been confirmed by microscopic examination of the painted stucco. Of these, the paint layer is generally about 0.1 mm in thickness. The

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white plaster, about the thickness of, and in some senses resembling, an eggshell. On this polished shell-like surface, the frescos were painted in watercolour. See Ibid, p.112.

Coomaraswamy describes that the technique of paintings at Ajanta and of Indian wall painting as follows:
The surface of the hard porous rock was spread over with a layer of clay, cow-dung and pulverised trap-rock, sometimes also mixed with rice-husks, to a thickness of from three to twenty millimetres (1/8 to 3/4 inch). Over this was laid a thin coat of fine white polished lime-plaster, which was kept moist while the colours were applied and afterward slightly burnished. AK Coomaraswamy, The arts and crafts of India and Ceylon, Today and Tomorrow's Printers and Publishers, New Delhi, 1913, p.87; History of Indian and Indonesian art, Munshiram Manoharlal, New Delhi, (reprinted) 1972, p.89.

Nagpall describes that the extensive Buddhist wall paintings in Ajanta and Bagh are made on mud plaster prepared from local resources. These clay aggregates have their distinctive components depending on the rock formation of the area and vary in tint. In any case, the plaster on the walls is generally built up in several layers, the uppermost being the least coarse. Various kinds of filling materials have been used to minimise the cracking of the mud aggregate, like straw, husk, hair, coarse, fibres etc, which also strengthen the mix. Dung is added in the mix to impart a degree of plasticity. JC Nagpall, Mural paintings in India, Gain Publishing House, Delhi, 1988, pp.23-24.

Craven believes that the surface of the rock walls of the caves of Ajanta was first prepared by a coating of potter's clay, mixed variously with cow dung, straw and animal hair. Once this was levelled to a thickness of half an inch to two inches, it was coated with a smooth, fine white lime plaster, which became the actual painting surface. Roy C Craven, A concise history of Indian art, Themes and Hudson, London, 1976, p.127.

Debala Mitra believes that the ground was first prepared by laying a rough layer of ferruginous earth, mixed with rock-grit or sand, vegetable fibres, paddy husk, grass and other fibrous vegetable-material, was applied to it. The surface was finally finished with a thin coat of lime-wash. Debala Mitra, Ajanta, Archaeological Survey of India, Eleventh edition, 1996, p.12.

Rowland thinks that the rough surface of the wall or vault was first covered with a layer of clay or cow dung mixed with chopped straw or animal hair. When this had been smoothed and levelled, it was given a coating of gesso (fine white clay of Gypsum) and it is on this ground that the actual painting was done. Benjamin Rowland, The art and architecture of India Buddhist, Hindu, Jain, Penguin Books, USA, 1953, p.243.
underlying layer of fine plaster varies in thickness from cave to cave and ranges in thickness between 2 and 3 mm. The thickness of the lowest coarse of plaster below varies over a wide range, being primarily determined on a particular spot by the unevenness in the rock surface.  

Thus, it is obvious that altogether Ajanta paintings are composed of three major layers; the support or the carrier; the ground; and the layer of pigments. Of these, as already stated the support or the carrier is the surface of the rock, which is rough in nature. Hence, it is certain that the support is the actual base on which the paintings are executed. Generally, these surfaces of walls and ceilings at Ajanta are full of uneven spherical-cavities created due to the evaporation of trapped gases during the eruption. But, it is obvious that while excavating the caves; the surface of the rocky-carrier was originally roughened with chisel-marks in different degrees to make better bonding and to suit the ground to be covered by painting as already noted above.

It was also mentioned above that the ground was mainly prepared by the application of two coats of plaster on the carrier or the support. Of these, the first coat was coarse in texture with a considerable amount of fibrous vegetable material and rock-grit or sand. The unevenness of the chiselled rock surface was properly rectified by the application of this coat. This was then made smooth by another layer of mud and ferruginous earth, again mixed with fine rock powder or sand and fine fibrous vegetable material. This fairly rough surface was finally rendered smooth by the application of a

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thin layer of lime-wash, which was then painted over.\textsuperscript{86} It has been revealed that this whole ground of the painting is composed of mud-plaster containing about 10 to 12 percent of combined water and organic matter, such as vegetable fibres, paddy husks, grass and other fibrous material of organic origin and rock-grit or sand. Silica is present to the extent of about 60 percent and iron and alumina account for 27 percent. In addition, lime and magnesia are also present to the extent of 2 to 3 percent.\textsuperscript{87}

It is obvious that roughened or grainy surface (more or less according to the nature of the work) mentioned above is always considered as a kind of bond and helps the application of any kind of ground to the support and subsequent coat of paint to the ground. Consequently, roughness of a support or ground is called the 'tooth' or the 'key' of the surface.\textsuperscript{88} However, it is noteworthy that being mainly of mud, the ground is soft and porous and it does not possess the natural strength and durability of common lime plaster.\textsuperscript{89} Nevertheless, it seems that great care was exercised by the artist in laying the ground, for although almost completely free from lime, it still had a degree of compactness and hardness, which rendered it fit to receive the brushwork. Particularly, a study of the grain-size or the particles constituting the plaster has shown that the mixture of ferruginous mud and gritty rock powder and sand was very carefully gauged and that the grains of silica possessed marked angularity, which has considerably contributed to


the firmness and compactness of the plaster.\textsuperscript{90} The fibrous material incorporated in the plaster for imparting to it a degree of strength has, however proved to be a serious drawback, for it has decayed partly on account of depredations by insect-pest and partly on account of the natural decomposition of the vegetable-matter under conditions of high humidity and temperature. According to all these observations it is clear that the longevity or deterioration of a painting mainly depends on the nature and preparation of the ground in most cases.\textsuperscript{91}

In this context, it is noteworthy that though the main ingredient of the Ajanta ground plaster is clay mixed with binding materials as discussed above, the ingredients and the quality of ground differs due to the difference in the evenness or not of the support base. In fact, it is for this reason that one notices several types of ground plasters in Ajanta. For instance, it has been observed that for a very uneven support the painters had used three layers of ground; for moderately uneven support two layers of ground; and for an uneven support just one layer of ground. It has been revealed that in each layer, binding ingredients of the clay ground also differed, but as already noted lime was not used along with the plaster.\textsuperscript{92}

Thus, to fill in the voids of the chiselled furrows of the most uneven rock surface, the first layer was made thick to even up the surface for subsequent coats of layers. It was found that in this layer, a kind of grass seeds, paddy-skin, fibre and stone chips of uneven sizes were mixed with clay. But, it should not be forgotten that all these ingredients have

\textsuperscript{90} Ibid, p.54.
not always been found together. The second layer was made of fine clay and sand mixed with fine fibre. At some places cotton and long grass have also been found from which it is evident that the early scholars did not identify this stratum of plaster separately. However, it is to be noted that this layer was applied between the first and the third layers, on the most uneven rock surface. But, sometimes this plaster was used directly as the first layer on another variety of wall surface i.e. moderately uneven support, for adorning with paintings. It is evident that on this moderately uneven surface, a thick layer of ground preparation was not required unlike the case of most uneven surface. In addition, it is noteworthy that this moderately uneven support does not have tooth enough to hold a heavy ground, like the uppermost layer. Hence, this finer and lighter second layer is the more appropriate one for this kind of uneven support.

The third layer is made of clay and very fine sand. It is evident that in most cases the paintings of Ajanta caves were executed on this layer. In this process, it is common practice that after a clay model has been made and before colours are applied, a clay paste comprising of clay mixed with water is applied on the model with a thick brush to obtain a smooth surface. The base becomes clean and smooth by this method and helps in colouring as well as bringing out the effects of the colours. Nevertheless, it is significant that the surfaces of the earliest caves no 9 and 10 are more whitish than those of a later period, since lime plaster was used in the process of plastering the two caves. Of these, particularly on the left wall of cave no 9, it is clearly evident that the paintings were originally made on lime-plastered ground. But, as mentioned in the previous chapters

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these were later covered up by clay plaster and painted anew around the fifth century AD.\textsuperscript{95}

Apart from these details obtainable from close observations of the paintings, it would be interesting to note the laboratory investigations and scientific analysis of the paintings of Ajanta done in the 1930s, which reveal at least two stages of plastering, i.e. rough and fine, in the preparation of the ground for the murals. Thus, as in the case of the early identifications, as recognized by Paramasivan too, clay and sand played a significant role in the paintings of the caves of Ajanta for the preparation of the rough plaster of the ground, while lime was present in a very low percentage. The presence of vegetable fibres in large quantity, along with other vegetable products, may be presumed, based on chemical analysis. It is also revealed that fine plaster was prepared out of a mixture of lime with a small percentage of Gypsum, i.e. Calcium Sulphate.\textsuperscript{96}

As in the case of Ajanta, at Bagh too a close examination of broken portions, suggests that the painting seems to have been done subsequent to the final smoothing of the surface. According to the process, perpendicularity of the wall does not appear to have been attended to in the original and underground chiselling, for the rough plaster is in places several inches thick, in others quite superficial, but over both is an even and finer

\textsuperscript{94} Ibid, pp.371-374.
\textsuperscript{95} Ibid, pp.371-374.
\textsuperscript{96} S Paramasivan, “Technique of the painting process in the cave temples at Ajanta,” Annual Reports of the Archaeological Department of His Exalted Highness the Nizam’s Dominions, 1936-37, pp.25-36. He further says that the rough plaster of lime was common with south Indian paintings.
Scientific investigations have revealed that this rough plaster was made out of mud.

Besides Bagh, though the paintings are not extensively available today, at Ellora too chiselling first roughened the rock surface so that the plaster could stick to it properly as in the case of the walls of Ajanta. It has been revealed that the plaster was composed of clay mixed with cow-dung, chopped husk, fine sand etc and its thickness varied from about 1 to 1.5 cm. Though it does not belong to the caves of the Buddhist group, on examination the plaster from Kailasa, the elaborate Hindu cave at the site has been found to be made of ferruginous earth, containing large quantities of silica, iron and alumina. The percentage of lime is very low and could have been present in the mud as an impurity. Over this rough plaster were given one or two more coats of lime plaster, which was made of lime and a small proportion of calcium sulphate. This plaster was reinforced with vegetable fibres. Thus, the main difference between the technique of paintings at Ajanta and that of Ellora is that there is no evidence of lime plaster applied over mud plaster in the later caves at Ajanta as examined by Paramasivan. But, it has to be admitted that there were many imperfections in the process of laboratory research followed by Paramasivan and the conclusions that he made. Hence, when considering the techniques of Buddhist mural paintings of India, it is more reasonable to adhere to the information obtainable from close observations of the paintings themselves.

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98 S Paramasivan, “Technique of the painting process in the cave temples at Ajanta,” Annual Reports of the Archaeological Department of His Exalted Highness the Nizam’s Dominions, 1936-37, pp.25-36.
As mentioned above, unlike in India, the Buddhist wall paintings of Sri Lanka, that are now extant are to be found on two durable supports: rock and brick walls of shrines and the relic vaults of the stupas. It is obvious that in case the support was a brick wall, laying an external plaster on which the paintings could be executed was the only requirement. In case the surface of the support was a rock, first, it was artificially roughened to allow for the adherence of the lowest layer of ground as already noted. This technique is clearly displayed by the support at Sigiriya as also at Ajanta, Bagh and elsewhere. It is evident that at all these places, the chiselling work was done with an iron point but in Sri Lanka the chips removed were smaller than in India as is evidenced by the marks. Undoubtedly, the quality of the rock mainly decided this procedure and consequently, smaller pittings were required to be plastered at the painting sites of Sri Lanka.101

Besides support or the carrier thus prepared, when considering the ground of the paintings of the Sri Lankan mural sites, Bell, the earliest scholar who worked on Sigiriya had concluded that this was about half an inch thick and comprised of tempered earth and kaolin of a reddish brown hue, strengthened with rice-husks and perhaps shreds of coconut fibre. He further concluded that upon this were laid at least two coatings of white lime, a quarter to half an inch thick.102 But, it has been found by later scholars that the ground plaster of Sigiriya was applied in three distinct layers as in the case of Ajanta.103

104 RH de Silva, Sigiriya, Department of Archaeology, Sri Lanka, 1976, p.19.
Of them, as correctly observed by Khan Bahadur Sana Ullah, an archaeological chemist of India who also participated in several restoration works of the wall paintings of Sri Lanka, the rock surface, which is rough and uneven, has at the outset been plastered with local red alluvium reinforced with vegetable fibres and rice husks. This material is very gritty and contains an appreciable amount of ferric oxide, which accounts for its red colour. The next layer consists of a buff coloured composition containing sand as the principal ingredient besides some clay, lime and vegetable fibres. The material is quite soft and can be readily powdered between the fingers. It also contains 5 percent calcium carbonate, corresponding to 2.75 percent lime, which is insufficient to confer necessary strength to the plaster. It is certainly inconceivable that the ancient painters of the island could have selected such a weak material for preparing the foundation for their paintings and the only reasonable explanation is that originally this layer had set sufficiently hard but has been reduced to the present weak state through natural deterioration, in the course of so many centuries. Probably some adhesive substances such as cow-dung, cereals, starch, glue, gum etc were employed and these have also perished by decomposition. The third or the uppermost layer, about 1/8 inch in thickness, is composed of sand and lime mortar to the value of 17.5 percent and is in a fair state of preservation. It has been worked up to a smooth and even surface with superficial application of pure lime, in order to receive the brushwork. The total thickness of the composite plaster varies between 3/8 inch and 1 inch according to the contour of the rock surface.


105 Ibid, p.3.
Thus, it is evident that in the process of laying the ground, there was a tendency to use lime (mixed with clay and sand) on thicker grounds and to retain the admixture of vegetable fibres in both the ferruginous clay layers as well as on lime-based grounds. It is interesting to note that more than one layer of lime-based ground has been used in a painting unlike the murals of Ajanta. However, the surface of each layer of ground was left irregular to provide a key for the next layer. In addition, on the surface of the clay ground, there was a concentration of paddy husks to provide further key or tooth for the next layer of lime-based ground. Finally, the application of a lime wash to receive the paints was retained. Accordingly, it is clear that the murals of Sigiriya are painted upon a thin layer of finely ground sand and lime, probably produced by burning aquatic molluscan shells. It is thus evident that as in the case of Ajanta the paintings of Sigiriya were also executed on a carefully prepared surface though the process considerably differed from that used at Ajanta.

Though the above applies to the paintings of Sigiriya, the main principles and techniques hold well for other sites of the island as well. Of these, in the painting of Hindagala, two types of ground are laid. The first type of ground is found in the upper part of the painting and this is finished in a better technique than was used in laying the second type in the lower part of the painting. No straw or other fibres except for paddy husks are

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106 This has been described by Gunasinghe that “At Sigiriya two more layers of plaster were applied, this time with a quantity of lime added to the mix. It would appear that the second layer was specially meant to fill out the undulations of the rock surface which, unlike at Ajanta, was not completely chiselled into an even plane. Over the second layer was applied a third, containing a very large proportion of lime (33.3 percent according to de Silva), mixed with sand and vegetable fibre. It is significant that at Ajanta neither of these intermediate layers of plaster has been noticed.” Siri Gunasinghe, “Ajanta’s shadow on Sigiriya,” The art of Ajanta: New perspectives, ed. Ratan Parimoo and others, Books and Books, New Delhi, Vol.II, 1991, p.502.
present and the grains of sand in the mix appear to have been sieved, for they are finer than in the ground of type two. Flakes of mica are also present in this ground. The average thickness of the complete ground is 6.1 mm and the surface is trowelled. The ground of type two in the lower areas of the painting is more compact than ground one. The surface is also not trowelled and does not bear an overall preparation for the painting. The ground is in two layers, the lower layer being 5.5 mm and the upper layer 7.3 mm in thickness; it is buff in colour and consists of a clay sand mixture containing no organic fibres or paddy husks.110

Though it is not clear at both the sites of Sigiriya and Hindagala, anthill clay may have been used. The saliva content exuded by the ants imparts to the clay an adhesive quality. The plaster mixed with this clay affords better internal circulation of air owing to the minute openings created within and helps thereby better preservation of the plaster from desiccation and consequent disintegration. The uppermost surface remains comparatively rougher and the whole composition has hardened like cement.111 Unlike at Sigiriya, at Hindagala, a very thin white coating composed of clay instead of the usual lime112 is laid on the ferruginous clay ground. Apart from the composition of this coat of

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109 VA Smith, A history of fine arts in India and Ceylon, DB Taraporevala and sons, Bombay, 1969, p.100.
112 The lime required for the preparation of plaster would have been taken from two sources, either from the sea as shells or as corals of geological origin. Analysis of the painting ground from various sites shows a very small ratio of MgO: CaO and it seems improbable that the mineral limestone was the source of lime for these ground. The very small ratio of Magnesium Oxide to Calcium Oxide in Sri Lankan lime plaster can be accounted for if coral and other aragonitic forms of shells were the source of Calcium carbonate for burning lime. Nimal de Silva, “Studies in the techniques of ancient paintings in Sri Lanka,” Perspectives in archaeology: Leelananda Prematilaka festschrift 1990, ed. S Senaviratna and others, Department of Archaeology, University of Peradeniya, 1990, p.130. For further details of obtaining the lime for grounds see Raja de Silva, “Painting: Early period 247 BC to 800 AD,” Archaeological Department centenary
lime wash, the method of laying the whole ground is similar to that found at Dambulla which is now in an exposed condition.113

At Vessagiriya, the first layer of ground is white lime sand mix with a trace of clay varying from 0.4 to 1.0-mm thickness according to the contours of the rock surface. This coat was suppressed by a thin white coating of lime in thickness of 0.8 to 1.0 mm with a very small proportion of clay. Unlike other sites, many areas of painting do not have the first ground layer, but only a thin coating of lime laid direct on the rock. Nevertheless, it is evident that in certain areas, there are three layers of thin coating.114 Besides, at Gonagolla, the ground consisted of two layers based on lime. The first coat varied from 2.0 to 2.6 mm in thickness and consisted of lime, sand and a little clay. The second layer was purer in lime 0.8 to 1.0 mm in thickness, containing a little sand and trowelled smooth to receive the paints.115

The Pulligoda paintings were done on a thin coating of lime with an average of 0.8 mm spread on a layer of brown clay-sand, chopped straw and paddy husks in thickness of 3.0 to 7.9 mm. There was a greater proportion of paddy husks and straw on the surface of the ground than in its body and flakes of mica were present. The interface between the brown coloured ground and the white coating was irregular. It is evident that the surface of the coating was generally worked smooth but was uneven to a slight extent compared

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115 Ibid, p.32.
with other places. Hence, this shows a reluctance or lack of experience in using a thicker coat of lime ground. At Mahiyangana, the ground of the painting is in three layers, the first is a brown mixture of clay and sand admixed with paddy husks, varying between 3.7 and 6.2 mm in thickness. The second layer was a pale buff coloured lime-clay and sand layer with a few plant fibres included. This was 0.41 to 1.0 mm in thickness. The third layer comprised of a white coating of lime sand with a trace of clay 0.8 to 1.2 mm thick, the surface being trowelled smooth and hard so as to expose occasionally the grains of the lower layer of lime plaster.

In contrast, it was found that at early sites like Sigiriya, Dambulla and Maraveediya, paintings were mainly on clay-based plaster as in the case of Ajanta and Bagh. In places like Mahiyanganaya and Pulligoda the first ground layer was of clay with the outer layers containing more lime. It is interesting to note that the plasters at the caves of boulder garden and Cobra-hood cave of Sigiriya, Gonagolla, Mihintale, vestibules of Ruvanvalisaya, Tivamka image house and Lankatilaka were mainly lime-based plasters. However, it is to be noted that though clay plaster was in continuous use, special significance may be attached to the use of mud plaster in early samples up to about 8th century AD, due to the presence of paddy husk and chopped straw, not found in mud plaster applied after the 12th century AD.

Apart from these rock surfaces, on the stone pillars and other covered surfaces of stone monuments and in vestibules of the stupas, a very thin coating of plaster was applied. In fact very little of this composition remains except in a few fragments at

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116 Ibid, p.32.
117 Ibid, pp.33-34.
Galvihara and Ruvanvalisaya. It is evident that in all these cases only one layer of fine lime and sand plaster was used. Over this was laid a very thin upper surface and the whole layer was not thicker than half an inch at the most. Nevertheless, the plasters applied on the brick built walls at Polonnaruva differ from those on stone pillars, rock and cave walls so far discussed. It is obvious that in quality, it is inferior and has nowhere received the same minute degree of attention as in the earlier stone surfaces. The first layer covering the brick wall consisted of lime plaster made up of sand, clay and lime mixed to a suitable consistency. The clay is a greyish alluvium deposit. The plaster is thick in places but varies between half to three quarter inches. The surface thus prepared has been covered with another thin layer of fine lime not thicker than one sixteenth of an inch. This final coating was smoothed over with the trowel.

Accordingly, it is clear that the outermost layer that received the pigments in all the ancient plasters of the Sri Lankan murals up to the end of 12th century AD was prepared in lime as in the case of Ajanta and Bagh, except at Hindagala where instead a layer of white clay has been used as the outer pigment receiving layer. It is also clear that there is no essential difference in the methods and materials of the wall paintings even in the later phase of the period concerned though the time gap is considerable since it runs up to the 12th century AD. Hence in Sri Lankan context it is obvious that there is a continuity of technique from the earliest times of the historical period up to the 12th or 13th centuries AD. The only conspicuous difference in this last phase is that in addition to the rock

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119 Nandadeva Wijesekara, Early Sinhalese painting, Saman Press, Maharagama, 1959, p.79.
120 Ibid, p.79.
supports, there survive paintings on brick walls. Besides, it is to be noted that the paintings on the brick walls of the relic chambers at Dadigama which belong to this last phase are unusual in technique and do not find a counterpart anywhere in the island. It has been found that this ground was of crushed brick, a material that has also been used as a plaster in the contemporary Baddasimapaśāda or the chapter house in the Alāhana parivena in Polonnaruva. It was a few millimetres thick and the superficial coating consisted of white clay as in the case of Hindagala. Interestingly enough, in all these cases, organic materials, which would have served to consolidate the ground and act as a binding medium were also used, which would dry and impart strength to the whole ground. This binding medium has been shown to be a mixture of an emulsion of a plant or vegetable gum and a drying oil.

It has to be noted at this point that as mentioned in the third chapter, it is recorded in the Vinaya Pitaka that the Buddha allowed walls of dwellings to be coloured and paintings of flowers and creepers were permitted. In addition, chapter six of the


Cullavagga, an early Buddhist canonical text, which forms a part of the Vinaya, records some of the materials of construction that may be used for Buddhist temples. In accordance with these stipulations, the paintings within caves were done on a ground consisting of a clay mix containing paddy husks. An organic binding medium was also added for strengthening the earth layers and causing them to adhere to the rock support. In addition, in order to enable pigments to adhere to the surface of the plaster, it is recorded in the Vinaya Pitaka that the Buddha said “anujānāmi bhikkhave sāsapakuddam sitthatelakam.” Horner has translated this short statement as “I allow, monks, mustard powder, oil of beeswax.” Consequently, this mixture has been identified as “a paste made of mustard seeds and oil of beeswax.” Besides, the Dhammapaddattakathsā or the Commentary on the Dhammapada of fifth century AD also states that the vegetable fibres in the form of rags cut into small fragments were mixed with the ground clay.

Although these ingredients were recommended by the early Buddhist texts, according to the above analysis it is evident that the ancient Buddhist painters of both countries do not seem to have strictly adhered to these ingredients or the rules. But, it has to be admitted that with the exception of the binding medium of the plasters, which is made of mustard seeds and oil of beeswax other details of the preparation of grounds adopted by the Buddhist painters of both countries were quite consistent with these

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Vinaya rules. This may also indicate usage of separate canons of paintings belonging to the Buddhist tradition which are now lost and were most probably different from the Hindu canons of painting that present different processes, formulae and ingredients.

The technique:

It is evident that the French term technique is derived from the Greek word Takhnikos,130 which gives the meaning of the method of doing or performing something especially in art or science.131 In relation to the sphere of art, the technique of an artist may apply either to the medium or method in which he works or of his particular treatment of the material he is using, his lighting or general approach to the work of art.132 Thus it is evident that the technique of a painting is almost dependent on its support or ground133 i.e. processing of the plasters and the method of application of the colours on them. In this context, it is significant that though terms such as “Ajanta frescoes” or “frescoes of Ajanta” and “Sigiri frescoes” or “frescoes of Sigiri”134 and so on have been used by

almost all scholars without any explanation there has been much discussion regarding the
effect process of murals of these sites and much difference of opinion has been expressed
by the experts.

It is evident that among the types of mural painting, Indian silpa texts refer to only
two types of mural painting, tempera and fresco secco and in actual execution of the
subcontinent too, it was restricted mainly to these two varieties of work. Consequently,
art technologists have argued whether the murals of Ajanta and Bagh are fresco (i.e. al
fresco; fresh or wet ground), fresco buono (i.e. buon fresco; genuine wet ground) or fresco
secco (i.e. dry fresco; process of painting on dry plaster) and tempera (painting with
pigments mixed with chalk or clay and diluted with weak glue or size) etc. The opinions
expressed by scholars like Griffiths, Coomaraswamy, Goloubew, Rowland.
He further believes that this art has been practised all over India since the time of the Ajanta paintings. John Griffiths, The paintings in the Buddhist cave temples of Ajanta Khandesh, 1896, Caxton Publishers, Delhi, (reprinted) 1983, Vol.1, pp.17-18.

Coomaraswamy believes that though the method was fresco, processing of painting at Ajanta differed chiefly from Italian fresco in the greater length of time the Indian lime remains damp and in the fact that the surface, after colouring, is burnished with a small trowel, by which process the colour is deeply ingrained. AK Coomaraswamy, The arts and crafts of India and Ceylon, Today and Tomorrow's Printers and Publishers, New Delhi, 1913, p.87.

Goloubew in his monograph on Ajanta says that the paintings are true frescoes, though some of them have been finished or retouched by a process analogous to tempera. See V Goloubew, "Documents pour servir a l'étude d'Ajanta, Les peintures de la premiere grotte" Ars Asiatica, Vol. X, Paris and Brussels, 1927.

Rowland believes that although Indian wall paintings can never be described as frescoes, in the true sense of the word, it is notable that the plaster ground was kept moist during the application of the pigments. Benjamin Rowland, The art and architecture of India Buddhist, Hindu, Jain, Penguin Books, USA, 1953, p.243.

Havell thinks that the process employed was usually that which is known in Italy as fresco buono, in which colours mixed with lime-water are applied to a prepared surface of the finest plaster, while it is still wet, so that they are chemically united with the ground. Indian fresco buono when the wall is a suitable one is an exceedingly permanent process for interior decoration and much more durable in a tropical climate than oil painting. Nevertheless, as it was largely used in exposed situations or in buildings that were not in themselves of a permanent kind. In fact, very few of the early Indian fresco paintings have survived and Ajanta paintings seem to be a combination of fresco buono and fresco secco. According to him this view is supported by very good historical evidence, the hereditary craft-tradition of Indian mural painting. The chief difference between Indian fresco and the Italian process of fresco buono is that the colours are united to the plaster ground by mechanical action (beating with trowel and polishing) as well as chemically, by the action of the lime. The Indian fresco is given a highly polished surface, which in the dust-laden atmosphere of India is a great advantage, as it prevents accumulations of dirt and enables the wall to be cleaned with a dry duster or by syringing it with water. EB Havell, The art heritage of India comprising Indian sculpture and painting and ideals of Indian art, DB Taraporevala sons, Bombay, 1908 and 1964, pp.65, 72 and 110. For the account of another variety of fresco painting of India, see Jayanta Chakrabarti, "Fresco-secco painting in India: A fresh technical scrutiny," Aspects of Indian art and culture, SK Saraswati commemoration volume, ed. Jayanta Chakrabarti and DC Bhattacharya, School of Historical and Cultural Studies, Calcutta, 1983, pp.154-161.

Bhavnani believes that ancient painters of India practised both techniques of tempera and fresco painting methods. Enakshi Bhavnani, Decorative designs and craftsmanship of India, DB Taraporevala sons, Bombay, 1969, p.15.

Chaitanya believes that Ajanta painting is not true fresco, as the colours were not applied when the lime was wet. Krishna Chaitanya, Arts of India, Abhinav Publications, New Delhi, 1987, p.48.

Haloi states that on close observation of the murals at Ajanta, it becomes obvious that there are no traces of joining of plaster-grounds, as in the case of fresco buono and he further describes that the colours used were opaque or semi-opaque in nature and mostly of mineral origin. For making different shades, two or more colours were mixed together. For tonal variations and opacity, white was often mixed with other colours. In the Ajanta paintings, for obtaining white colour, lime has been used as an inert pigment and mixed with other colours when found necessary, this has contributed to the resulting brilliancy. Accordingly, it is clear that Ajanta murals as that of gouache medium painted on dried mud plaster ground, instead of tempera, fresco buono or secco mentioned in many case studies. Ganesh Haloi, "Ajanta painting: Its technique and execution," The art of Ajanta: New perspective, ed. Ratan Parimoo and others, Books and Books, New Delhi, Vol.II, 1991, pp.366-367.
India have been done according to the fresco method or following some kind of fresco technique.\textsuperscript{144} Under this impression, some scholars have gone to the extent to state that Indian painting, at least what remains of it, was till the 13\textsuperscript{th} century AD an art of fresco painting or variation of fresco process.\textsuperscript{145} But, others have concluded that in the long history of extant Indian mural paintings, from the time of Ajanta to the 19\textsuperscript{th} century AD the most common medium has been tempera.\textsuperscript{146} Hence, it is essential to examine at this point what the conspicuous characteristics of a fresco painting or the fresco process are in contrast to the tempera technique.

It is obvious that the term ‘fresco’ is derived from the Italian term connoting fresh.\textsuperscript{147} Although this method has been practised in Minoan and other ancient civilisations\textsuperscript{148} the technique that we now call ‘true fresco’ that is ‘buon fresco’ was first perfected as a practical theory in Italy in about 1300.\textsuperscript{149} It denotes the most durable form of art known to Europe where a piece of painting must be completed on a wet and freshly laid

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\footnote{145}{Karl Khandalavala, Indian sculpture and painting: An introductory study, DB Taraporevala sons, Bombay, (n.d), p.51.}

\footnote{146}{Jayanta Chakrabarti, Techniques in Indian mural painting, KP Bagchi and co, Calcutta, 1980, p.14.}

\footnote{147}{Joyce M Haw Kins and others, The Oxford study dictionary, Penerbit Fajar Bakti, SDN, BHD, Kuala Lumpur, 1994, p.271.}


\footnote{149}{See Mrs Merrifield, The art of fresco painting as practiced by the old Italian Spanish masters with a preliminary inquiry into the nature of the colours used in fresco paintings with observations and notes, Alec Tiranti ltd, London, 1952, See introduction; For a discussion of fresco paintings in Italy during the late middle ages and the renaissance please refer to Millard Meiss, The great age of fresco: Discoveries, recoveries and survivals, Phaidon Press, London, 1970, See introduction, pp.13-21.}
\end{footnotes}
stucco ground before another piece of plaster is prepared.\textsuperscript{150} It consists of painting with lime-resistant colours (not chemically affected by lime) on damp lime-plaster, i.e. plaster that has not yet set. In this process as the plaster can only be painted on in this state the painter divides his work into so-called ‘day-pieces,’ each day piece being the area, which he can finish in one day. Thus, in ‘buon fresco’ nothing can be added or altered after the plaster has set. This time factor gives fresco painting an extraordinary vitality because it means that the brushwork must be quick, the forms monumental and the range of colours limited.\textsuperscript{151} In addition, when the plaster sets, the particles of colour crystallise into the wall and remain permanently fused with it. They cannot flake off as they can in secco method; the fresco can only be damaged if the wall decays in some way, by efflorescence, for instance, or if the plaster flakes off. The relevant plaster layers must therefore be very carefully built up.\textsuperscript{152}

The term fresco-secco means painting on lime plaster, which has set unlike the genuine fresco. In fact, it is a technique of great antiquity the pigments being ground in an aqueous binding medium. In this technique, the completely dry lime plaster wall is thoroughly saturated with lime water (or baryta water) and left overnight. The painting then takes place on a moist surface as in fresco, except that the colours are mixed with a solution of casein glue or egg yolk, instead of being ground in water only. This is the traditional meaning of secco, but in a wider sense, as in its original Italian meaning, it can

\textsuperscript{151} Kurt Herberts, The complete book of artists' techniques, Themes and Hudson, London, 1958, pp.42 and 47.  
indicate any dry (as opposed to fresco or fresh plaster) method of wall painting, including for instance, work such as tempera painting upon a dry wall. Nevertheless, it has to be admitted that the so-called secco technique or painting on dry plaster has always existed side by side with fresco method. It is evident that in this process, to ensure that the pigments will fuse completely with the ground as they do in 'buon fresco,' the surface is thoroughly soaked and washed down several times with slaked lime to which some fine river sand has been added. The paint must be applied while the slaked lime is in this viscous state. The execution should be free, dashing and a good deal of skill is required not only in the handling of the paintbrush but also in making the best of a restricted palette and equally restricted range of expression.

Accordingly it is clear that though the process is somewhat similar fresco secco is in some ways easier to paint than genuine fresco. In this technique, the artist is neither limited to colours which resist the action of lime, nor is he tied to the “day-piece.” However, the various methods of secco painting depend on whether size, casein or distemper is used for the ground for the vehicle: on these in turn depend the quality and intensity of the colours. In fact, innumerable variations are possible according to the combination of ingredients: the grain of the ground, the nature of the vehicle (which can make the colours transparent or opaque), the colours themselves and all these combined to

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155 See Olle Nordmark, Fresco painting: Modern methods and techniques for painting in fresco and secco, American Artists Group, New York, 1947. Specially refer to the details of fresco ground, plastering the fresco ground and painting the fresco etc, pp.21-37, 67-86.
enhance or subdue each other’s effect. Consequently mural paintings executed in secco method may look very different; the technique chosen would depend on the immediate purpose of the work to be carried out.\textsuperscript{156}

However, it is evident that another, quite dissimilar branch of secco is practised with opaque distemper. In this technique it is not the grain of the plaster ground, which constitutes the surface but a soft, matt, almost cloth-like layer of paint, which completely conceals the texture of the wall. The colours are rich and deep. The influence of the necked plaster is eliminated in the finished work, so that the whole picture surface must be painted. Consequently, the painting is isolated from the rest of the wall, assuming an independence, which may entirely change the character of the room.\textsuperscript{157} In addition, there is still another secco technique that is particularly conducive to free, large-scale work. With this method distemper and colours are glazed on to a smooth ground, which has previously been soaped. The brush glides easily over the surface; there is no roughness to resist its progress. The brush strokes do not entirely disappear and delicate effects similar to watercolours can be obtained.\textsuperscript{158}

Of these few variations, it is interesting that the greatest masters always had a special predilection for the technique of fresco. Certainly, this process of painting gave them greater inspiration than any other technique. The question that arises at this point is why this predilection for fresco? What distinguishes fresco from other methods of painting? Basically, it is clear that there are advantages to adhering to the technique since


\textsuperscript{158} Ibid, p.38; See also WG Constable, \textit{Painter's workshop}, New York, 1953, p.60.
fresco is very durable and the colours are extraordinarily luminous, which makes them so suitable a medium for wall painting. In addition, there is a subjective reason from the painter's point of view since in fact fresco painting is a challenge to the artist: a 'thrilling tension persists as long as he paints:' he has a constant struggle with the wall, he must work quickly and accurately, without doubt he must be absolute master of the technique and every brush stroke must be right the first time.\(^\text{159}\)

However, in the context of this study it is obvious that the term fresco is often incorrectly applied to what are best described as mural paintings of ancient India and Sri Lanka. Indeed, these Buddhist murals at Ajanta and elsewhere now it seems beyond doubt, particularly from the evidence of restoration works and the scientific tests, were executed in tempera technique on dry plaster, the layers of plaster being as thin as egg-shell in some places. In addition, polished sections of the painted stucco also clearly show that the pigments stand out as a thin but distinct layer on the ground unlike in the case of the fresco method. Obviously, no diffusion of colours into the body of the plaster is noticed; the pigments are neatly superimposed on the surface without permeating into the body of the plaster. Thus, the form of the pigments, the flaking of colours, the lifting up of paint-film in the form of cups and the blistering effect, all these show that the technique of paintings at Ajanta was not that of fresco buono, which is not affected by water since the pigments are not softened by it.\(^\text{160}\) This conclusion is further confirmed by the fact that in most cases the insides of the cave surfaces can hardly be smoothed


sufficiently to take wet fresco. In addition, they sweat a great deal which is not suitable for the technique of wet fresco either.\textsuperscript{161}

It may be emphasised at this point that in the process of preparing the ground and then fastening colours on that ground, the binding medium plays a very significant role in painting. In fact, as in the case of plaster in the characterisation of the technique of a painting, the nature of the medium is always taken into consideration and accordingly, the universally accepted classification such as, oil, watercolour, tempera, fresco etc is generally formulated based on the medium.\textsuperscript{162} But, unfortunately the binding medium of Ajanta has now largely perished partly because of autoxidation and partly due to the depredations by insect-pests. Consequently, the bond between the pigments and plaster has now become weak and this has resulted in the flaking off of pigments. Under these conditions,\textsuperscript{163} the problem of identifying the binding medium even through chemical analysis is rather difficult and there are almost insurmountable factors that stand in the way of arriving at a definite conclusion. However, the results of such scientific researches also indicate that in the Ajanta murals glue was the only organic binding medium\textsuperscript{164} that held the pigments firmly to the ground unlike in the fresco method. Thus, all these facts would definitely point to a tempera technique at Ajanta.\textsuperscript{165} Nevertheless, it is to be noted that the word tempera is loosely used for any method of painting in which the colours are mixed with such substances as egg white, egg yolk, casein, glue or

\textsuperscript{162} Asok K Bhattacharya, Technique of Indian painting: A study chiefly made based on silpa texts, Saraswat Library, Calcutta, 1976, p.87.
gelatine. But, in reality, true tempera is when the colours are ground with egg yolk only. According to this clarification, it is obvious that the technique used at Ajanta was a kind of tempera, which amounted almost to fresco secco that is to say the pigment was applied to dried plaster.

It has been revealed that the technique of Bagh is also tempera. Halder and Khan pointed out that gum was used in this process as the medium as in the case of the murals of Ajanta. In addition, there does not seem to be much difference in the technique of wall paintings at Ellora and Ajanta too, though it has been concluded by some scholars that the paintings of Ellora have neither been executed in the tempera technique nor are they true frescoes for there was no other binding medium used except lime. Thus, according to all these descriptions, it is clear that though the term "fresco" is in use even today for the Buddhist mural paintings of India, undoubtedly this usage is incorrect since the technique of all these paintings is tempera rather than fresco.

As in the case of the Buddhist mural paintings of India, various views have been expressed concerning the technique of wall paintings of Sri Lanka too. A century ago, Bell had stated that like the so-called frescoes at Ajanta those of Sigiriya are strictly

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paintings in tempera, i.e. the pigments used were mixed with some liquid vehicle and laid on a dry surface, though a few years later he changed his mind and stated that the latest pronouncement is that they are true frescoes. Subsequently, Coomaraswamy also referred to the paintings of Sigiriya as frescoes and appeared to have been guided by the publications of Bell to which he refers. Meanwhile, based on Bell's first statement Smith also states that the paintings were wrought in tempera on a dry surface. Nevertheless, Havell stated that there is no known process of tempera or oil painting, which would stand exposure to tropical weather for nearly fifteen hundred years as those at Sigiriya have done. Hence, he believes that the process employed both at Ajanta and Sigiriya was some modification of the present Indian fresco process. Subsequently, Dhanapala and Wijesekara also suggested that at Sigiriya at least, true fresco elements are obtainable to a greater extent than at the subsequent sites of the island, although it was a modification adapted to suit the local conditions. The latter, further concludes that it is difficult to deny that the process employed at Sigiriya was a mixture of true fresco and tempera since a careful examination reveals traits of both techniques. Therefore, he believes that the paintings were not on the whole true fresco but

173 HCP Bell, Archaeological Survey of Ceylon Annual Reports, 1905, p.16.
a slight modification of the method devised and put into practice by the artists of the period.\textsuperscript{179}

It is evident that the later scholars have also continued this approach with slight modifications. Of these, the opinion expressed by Maranzi, an expert Italian restorer is conspicuous, since he has stated that the technique of Sigiriya is fresco secco\textsuperscript{180} and to confirm this notion he has wrongly concluded that the paintings of Sigiriya are executed on a thin lime wash laid direct on the rock surface.\textsuperscript{181} Similarly, some writers have gone to the extent to state that the paintings of Sigiriya show affinity to Italian buon fresco\textsuperscript{182} while some others have stated that the murals of Sigiriya were painted on the damp walls and it was natural for the colour to spread on such a wall\textsuperscript{183} though an observant eye fails to find such characteristics on the paintings of the site.

Thus, it is evident that there is a difference of opinion among scholars on the techniques of Sigiriya paintings as in the case of Ajanta murals and therefore, it is necessary to discuss the issue in some detail. Particularly, Dhanapala is of the opinion that blue and green were omitted from the Sigiriya palette and this would be very difficult to account for if the technique employed were tempera, but is easily explained if the possibility of the techniques being fresco is allowed. Only natural earths could be used in fresco painting, but blue and green have to be obtained from sources other than natural

\textsuperscript{179} Nandadeva Wijesekara, \textit{Early Sinhalese painting}, Saman Press, Maharagama, 1959, p.83.
\textsuperscript{181} Ibid, p.4.
earths. Hence, their alleged absence in the Sigiriya painting. The presence of green at the site has been proved a later addition. As he further concluded, the presence of an alteration in the position of a hand in one of the figures, which was mentioned in the previous chapter, is attributed to the employment of a fresco technique. In the genuine fresco technique the colours are so thin that the altered hand in the figure is still visible in spite of the frantic efforts of the artist to hide it. The artist changed his mind but before he had time to erase the original hand the plaster dried.\(^{184}\)

In fact, although the blue pigment has not been used in Sigiriya murals in abundance,\(^{185}\) it is evident that the green was originally used and this was not a later addition. Further, Dhanapala is incorrect in stating that the blue and green have to be obtained from sources other than natural earths: the blue pigment or lapis lazuli and the green earth or terre verte are naturally occurring materials as their names themselves suggest. In addition, regarding the presence of alteration in the position of a hand, an examination of the painting does not disclose any evidence of scraping, over-painting of background, overall colour or any other attempt to erase the yellow line of the original hand. No doubt that the artist changed his mind, painted the contours and coloured another hand (Plate XII), but if the plaster had dried before the artist had time to erase the hand as Dhanapala believes, it is difficult to understand how he found the time to finish the contours of the hand in the altered position and to paint the colours in a fresco


\(^{185}\) It is evident that one of the ornaments of the ladies on the main rock of Sigiriya has been painted in blue colour. In addition, the paintings at boulder gardens of the site are also reveal that the blue pigment has abundantly used.
Hence, it is evident that as Coomaraswamy also observed, the basis and technique of Sigiriya are practically the same as at Ajanta and as Sana Ullah concluded, possibly some adhesive substances were also mixed with the composition, but these have perished by decomposition. However, since the colours were affected by water the painting method appears to be tempera. It is interesting to note that it has been revealed by modern scientific tests also that the characteristics of paintings at Sigiriya are consistent with a tempera technique.

Though in all the other painted sites of the island, the method employed was also entirely tempera as in the case of Sigiriya, some scholars believed that the paintings found in the relic chamber of Mahiyangana stupa and the murals at the Tivamka image house belonged to the fresco type. It was argued that particularly the paintings of Mahiyangana are in fresco technique, because being a relic chamber and humid like an Etruscan tomb, it was painted in tempera on wet plaster and the humidity of the environment facilitated the formation of calcium carbonate fixing the colours in fresco over a period of months. Thus the technique was described as fresco secco finished in

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190 Nandadeva Wijesekara, Early Sinhalese painting, Saman Press, Maharagama, 1959, p.58.
tempera method though some early scholars have rightly observed that as in the other cases these have also been done on dry plaster using tempera pigments. Thus, it is obvious that no evidence is available to support the view expressed by some scholars that the ancient paintings of Sri Lanka are frescoes. Instead, it has been established that the general technique of the Buddhist mural paintings of Sri Lanka has always been some kind of tempera as in the case of the Buddhist mural paintings of India. Therefore, it is to be stressed here again that though the term "fresco" is in use even today for the identification of paintings at Sigiriya and elsewhere on the island it is a misnomer in every sense, as in the case of so-called frescos of Ajanta since these were also painted according to the method of the tempera technique.

The pigments and the binding medium of the paints:

According to the above discussion, it is obvious that the paintings of Ajanta have been executed after applying a lime wash mixed with gum or glue over the mud-plastered ground. These paintings clearly display a variety of pigments and the most conspicuous primary paints are yellow, red, blue, white, black and green along with mixtures of these in various shades. It has been found that these pigments with the exception of black are of mineral origin and lime resistant in nature. Of these, the red and the yellow pigments are

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193 Ibid, p.3.
red and yellow ochres\textsuperscript{197} respectively and lampblack or carbon was used for black colour extracted from lamp. For white kaolin, lime and gypsum (calcium sulphate) were used and for green, glauconite i.e. terra verte. Lapis lazuli, a costly semi-precious mineral was used for blue and this alone was imported usually either from Persia or Badakshan\textsuperscript{198} as it has not been reported from the neighbourhood. In contrast, these blues are still exceptionally fresh and bright, but conspicuously absent in the earliest paintings.\textsuperscript{199} It is evident that historically this lapis lazuli is known to have been used for ornaments too.\textsuperscript{200}

However, there is also hardly any evidence for the use of copper compounds such as malachite for green and azurite for blue. Terra verte, mineralogically called glauconite is a green complex white ferrous silicate and is a secondary product of weathering of the basalt. Ochrous clays, such as red and yellow ochres were also evidently obtained from the clayey product of weathering of the rock. The presence of such other pigments as verdigris, vermilion, cinnabar, orpiment, realgar or red lead has not been established on the basis of chemical, micro-chemical and spot analysis.\textsuperscript{201} Accordingly, it is evident that except lapis blue, all the other pigments viz. white, red, yellow and green were locally available as residual products of the volcanic rock.\textsuperscript{202} Thus while there is no clear evidence for the use of any organic colouring-material, whether or not it was used remains an open

\textsuperscript{198} VA Smith, A history of fine arts in India and Ceylon, DB Taraporevala and sons, Bombay, 1969, p.90.
\textsuperscript{201} Nevertheless, of these, Smith describes that the yellow of ancient painters is believed to have been always orpiment, a natural arsenic sulphide. See VA Smith, A history of fine arts in India and Ceylon, DB Taraporevala and sons, Bombay, 1969, p.90 Haloi believes that bright red from lead which can only be found in Vessantara Jataka of cave no 17. See Ganesh Haloi, “Ajanta painting: Its technique and execution,” The art of Ajanta: New perspective, ed. Ratan Parimoo and others, Books and Books, New Delhi, Vol.II, 1991, p.375.
question, since even if it was used it must have perished, leaving behind no evidence of its possible prior existence. 203

The colours of the murals at Bagh are also excessively vivid with marked contrasts in blue, red, green and yellow as in the case of Ajanta. 204 Earthen mineral and stone pigments, identical with those employed at Ajanta are known to have been used. Besides, it is evident that the application of lac-red was also known at Bagh. 205 Thus, the pigments of the site were vegetable and mineral dyes of which the former is not clearly observable at Ajanta. However, in contrast, the painters of Ajanta and Bagh commonly accepted pigments such as yellow ochre, red ochre, carbon and lime. It seems that there was definite reason behind the use of such a limited range of pigments in Indian murals. As pointed out by Paramasivan, only those pigments were selected for the wall paintings that were not sensitive to some minerals, for the painting processes followed by the painters consistently involved a predominating use of some minerals like lime as evidenced by the painting process of Ellora. 206 However, it is evident that the colours at Ajanta can easily be softened by plain water, as in the case of the ground plaster at the site. This is an indication of employment of water-soluble binding medium with the pigments, so that the binder

204 Impey wrongly concludes that this was mainly due to the influence of Greek paintings. See E Impey, "Description of the caves of Bagh in Rath," Journal of the Bombay Branch of the Royal Asiatic Society, Vol.V, July 1856, p.562.
206 S Paramasivan, "Technique of the painting process in the cave temples at Ellora," Annual Report of the Archaeological Department of His Exalted Highness the Nizam’s Dominions, 1936-37, p.38; See also Asok
holds the particles of the pigments together adheres to the ground in form of a separate
layer at the same time.\textsuperscript{207} It has also been revealed that a clear proof of the existence of
vegetable glue or gum as the binding medium has been furnished in some cases by a
careful chemical and microscopic analysis of pigments. This chemical analysis further
shows that animal glue was probably employed.\textsuperscript{208}

In contrast to Ajanta and Bagh, the range of colours used at Sigiriya is restricted to
a few colours. The dominant colours thus used in the paintings are yellow, burnt sienna,
brown green and white. Of these, yellow is used in two different tones, that is the golden
hue of the skin of the noble ladies in general and the light creamy colour seen in the blouse
of one of them. Green is usually copper green and rarely the light leaf-green, which is
sometimes seen in the headdress of the ladies. White is often applied to pick up the
ornaments and the white of the eyes, while the outlines of the figures are usually in a
brown tone. Pink appears occasionally in flowers. Grey is rather rare but used in two
tones, light and dark, as seen in the headdress of the lady with the creamy yellow
blouse.\textsuperscript{209} Light blue, which has been claimed as not being used in the series\textsuperscript{210} is also
found, applied sparingly.\textsuperscript{211} This colour is reserved for special features such as the eyes,
the gems upon the tiaras and the wristlets and neck ornaments etc. Thus it is evident that
beside these primary colours, a range of mixture of colours has also been used at the site.

\begin{itemize}
\item K Bhattacharya, \textit{Technique of Indian painting: A study chiefly made based on silpa texts}, Saraswat Library, Calcutta, 1976, p.69.
\item VA Smith, \textit{A history of fine arts in India and Ceylon}, DB Taraporevala and sons, Bombay, 1969, p.100.
\end{itemize}
It is evident that the composition of these pigments is as follows: red-red ochre, yellow-yellow ochre, green-green earth, terre verte or iron silicate and black-carbon. Of these, it is believed that powdered terra verte imported from India was the green pigment used. The buff pigments contain iron (as ochre), white material insoluble in 2N-hydrochloric acids and concentrated sulphuric acid and are probably yellow ochre and kaolin or silica. However, the white is not calcium sulphate. Thus, both at Ajanta and Sigiriya, the principal colours and the materials used are largely the same: red, yellow, green, and black. Nevertheless, it is obvious that red, yellow, green, black, white and blue are the dominant colours used at Ajanta producing a much more varied palette than at Sigiriya. Thus, the richness of colour at Ajanta becomes obvious when compared to the yellow-orange-red spectrum of Sigiriya. It is also apparent that there is a vast difference in the use of colours in the portrayal of the human body and nature, between Ajanta and Sigiriya. This difference is further confirmed by the fact that there is an absence of artificial highlighting of prominent features by using white as applied at Ajanta as discussed in the previous chapter in detail. Instead, the subtle application of colour as seen at Sigiriya makes the figure glow as if with light from within.

Although Smither has given quite a different list of colours a century ago, specially with relation to the murals of vestibules of the stupas; it has been found that the

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216 Smither describes that the blue was probably indigo, the red vermilion and the yellow orpiment (a preparation of arsenic and sulphur, producing a gold-coloured pigment). Yellow from its religious association, was pre-eminently popular with the Buddhists, it is therefore, the predominating colour in all their decorations, the red taking the next place and the blue while subordinate to the others, being often
pigments commonly used for the other early painting sites of Sri Lanka were lime for white, red ochre, yellow ochre (orange shades being obtained by mixing the colours), the green terre verte and carbon for black. Mixtures of red ochre and carbon black produced brownish colour. The rare blue pigment lapis lazuli (natural ultramarine) was found in a few paintings of the early period. Of these, besides the paintings of Sigiriya mentioned above one of the fine examples is the depiction of the goose and the floral designs found on the northern and eastern vestibule of the Jetavana stupa, which is now deposited at the archaeological museum at the site. As in the case of India, this mineral has not been reported in Sri Lanka and appears to have been obtained via India from Badakshan in northeast Afghanistan where the only deposit in Asia is known or from lake Baikal.219

As in the case of the method and the materials of the plasters, it is interesting to note that the pigments used during the last phase of the period concerned i.e. around eleventh and twelfth century AD are also not different from those used in the early sites, but the blue lapis lazuli is apparently absent from the painters' palette. In addition, at Ajanta, Sigiriya and Hindagala the yellow so largely used at Anuradhapura is very rare. It was found that the other pigments used in the later phase were black containing iron and mixed with yellow and sometimes with white as well to form green of various shades; white is also frequently used alone, but principally as a ground work for the paintings. He further concludes that the colours used appear to have been tempered with gum, to give them body. JG Smith, Architectural remains of Anuradhapura, Ceylon Government Press, Colombo, 1894, p.42.


silica and red containing iron ochre. Thus, in contrast, the four major colours left in ancient Sri Lankan paintings drawn before the 13th century AD were red ochre, terre verte, lapis lazuli and in some of the paintings one can see the traces of black pigments. Of these, both terre verte and lapis lazuli were not available in Sri Lanka and would have been imported from elsewhere as already mentioned above. It is obvious that due to the scarcity of these materials Sri Lankan artists have used it sparingly. These investigations also revealed that two sources of obtaining pigments might have been exploited: One was the mineral pigments and the other a vegetable source. Of these, it is evident that naturally obtainable mineral pigments were utilised wherever possible, except in the rare case of black, which is obtained from carbon.

When considering the binding medium of paints in Sri Lanka, it is to be noted that the pigment layer of Sigiriya contains a water-soluble synthesis that hastens out as a white fluffy material on the addition of excess ethanol. Hence it has been concluded that it is a vegetable gum; the other component of the binding medium was identified as a drying oil, which was water insoluble, but soluble in ethanol, carbon tetrachloride and chloroform. Even at the other painting sites of the island, the binding medium of paint as in the case of binding medium in the ground was usually an emulsion of plant gum and a drying oil though in a few paintings, the binding medium was found to consist of a plant gum.

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only. It has to be noted at this point that from a study of literary documents too it has been concluded by some scholars that ancient Sri Lankans were aware of a technique of painting in an oil medium. Certainly, it is obvious that if oil had not been used as the medium for outdoor work, as in the case of the paintings of late medieval period of Sri Lanka, it is difficult to understand how these could have lasted. Hence it is obvious that there was an apparent reason for using an oil medium for the wall paintings of ancient Sri Lanka since almost all the murals were located outdoor, unlike the painting sites of India.

According to the discussion so far, it is clear that there are some similarities as well as some significant dissimilarities between the two mural painting traditions of both countries, where elements such as the supports, grounds, techniques, pigments and the binding gum etc are concerned. Of these, the difference between the architectural elements where the paintings have been executed is conspicuous. In addition, apart from the prepared rock surfaces designed in somewhat dissimilar technique, it was mentioned above that the ground of the painting at Ajanta consists of a layer of ferruginous clay mixed with sand, vegetable fibres and paddy husks over which is laid a superficial coating of lime in preparation for the paints. Accordingly, the technical process of painting was found to be tempera and the medium soluble in water was detected. It is seen that these

technical methods are fairly similar to those adopted at Sigiriya\(^{227}\) and most of the other painting sites of the island.

In addition, two layers of ground clay have also been found both in the caves of Bagh in India and Dambulla in Sri Lanka. It is also evident that as in the case of Sri Lankan paintings, in Bagh too the base was provided with a lime-based ground of appreciable thickness (from 3.4 to 6.5 mm.) reinforced with vegetable fibres.\(^{228}\) Hence, it is clear that there is a considerable similarity between the technique of laying the ground in Indian painting sites and the earliest Sri Lankan paintings not only with relation to the murals of Ajanta and Sigiriya, but also to the murals at other sites as well. Another similarity is that the common earth pigments, yellow earth (yellow ochre), red earth (red ochre) and green earth (terre verte) are found in both countries, though the blue pigment, lapis lazuli was used primarily in the Indian paintings and rarely in Sri Lanka since it is evident that this pigment is known to be present only at a few places of the island. Besides, though Gypsum was widely used as a white pigment at Ajanta, it has not been found in Sri Lankan paintings.\(^{229}\)

**Instruments of the painters:**

It has not been possible to obtain any direct evidence regarding the implements used by the ancient Buddhist mural painters of India and Sri Lanka. These being made of


perishable materials have not outlived the paintings. However, of these, no doubt the painting brushes had a prominent place. The early *silpa* texts have described separate brushes of different thickness, broad, fine or medium to be used for each shade of colour and the brush should be shaped like the sprout of a Banyan tree. Interestingly enough the brush strokes as evident in the paintings of Ajanta, Bagh, Tivamka shrine and elsewhere are quite consistent with these classifications.

Beside these brush strokes, it is noteworthy that two actual illustrations in the extant paintings of Sri Lanka of the period concerned also disclose some information regarding the brushes of ancient painters. These paintings preserve figures of persons in the very act of portraying figures with the brush. These examples are seen in the Sasa Jataka painting at Dimbulagala and the other at Tivamka image house. In these paintings, the god *Sakra* is depicted in the very act of painting the figure of the hare on the moon. As evident by the paintings, the brush is a thin object and the method of holding the brush, the comparative size and shape can also be judged. From the other evidence especially relating to the medieval period of Sri Lanka, it can be noticed that three types of brushes, sometimes in accordance with the instructions of painting canons mentioned above, might have been used. One was the rough brush made from the aerial roots of trees and may have been large and crude. The smaller brushes were fashioned out of cat or

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230 Jayanta Chakrabarti, *Techniques in Indian mural painting*, K.P. Bagchi & co, Calcutta, 1980, p.71; Asok K Bhattacharya, *Technique of Indian painting: A study chiefly made based on silpa texts*, Saraswat Library, Calcutta, 1976, pp.49-51. It is to be noted that according to the descriptions given in these *silpa* texts, Coomaraswamy has also presented three kinds of brushes, which were used by the ancient painters as coarse, medium and fine. As he has observed, sweeping on is to be done with the coarse one, using it crosswise; do the modelling with the medium one and holding the point sideways. Ananda Coomaraswamy, “The technique and theory of Indian painting.” *Technical studies in the field of fine arts*, Fogg Art Museum, Harvard University, Vol. III, No.2, 1934, p.62.
squirrel's hair, the tuft being fastened to a thin wooden holder. The finest brush with a trailing point suitable for fine line drawing was made of Telitana grass.

As in the case of the painting brushes, it has not been possible to obtain any direct evidence relating to the palettes of the painters too. Nevertheless, from the same scene of the Sasa Jataka painting at the Tivamka shrine it transpires that the palm of the freehand of the painter himself was used to contain the pigments immediately in use. But, it is worth noting that the artist DL Perera who made the line drawings in 1909 reproduced the god Sakra in this ‘Sasa Jataka’ painting making use of his left palm as a palette. This was subsequently contested by the artist SM Senaviratna who copied the drawings in 1969 and who reproduced a palette more or less like a coconut shell in Sakra's left hand. Nevertheless, due to the sorry condition of the actual painting, one cannot now judge from an examination of the same painting, which of these two is correct. In addition, it is evident that clay pots filled with paint, which belong to the later centuries, have been discovered within painted cave temples of Sri Lanka. Hence, it is not unlikely that clay vessels of various sizes contained the other requisite pigments. Thus, probably, the palm of the hand of the artists and the small clay vessels helped to contain the pigments in use as the palettes of the painters during the ancient period.

Apart from these two main instruments of the painters, it is evident that at least the painters of Ajanta used compasses to draw the numerous circular and geometrical designs on the canopies on a large scale. The large circles of designs drawn on the canopies of the cave nos one, two and others of the later period are the best examples for the indication of

231 M. Somathilake, *A historical study of mural paintings in Buddhist temples during the 18th and 19th centuries of Sri Lanka*, Unpublished MA dissertation, University of Peradeniya, 1996, see fifth chapter, which deals with the techniques of paintings.
using such compasses. In addition, it is noteworthy that as in the case of the above instruments, there is no clear evidence regarding the implements that have been used for grinding the pigments too. However, pits and holes in the rock floor are seen in Ajanta and afford substantial evidence of the preparation of the pigments by the Buddhist painter who required his colours in good quantities. For instance, at least nine such small holes can be seen close to each other on the left side, between the sidewall and the line of pillars on the floor of cave no 10 alone (Plate XXIII) though Spink has incorrectly decided that these have been made by cowboys for sharpening their axes.

Thus, it is obvious that there are similarities as well as dissimilarities and analysis shows the use of ingredients in one place that cannot be traced in the other, especially materials used for laying the ground and the pigments. In this respect, where Ajanta and Sigiriya do agree is in the use of a final application of an eggshell thin layer of pure lime as the priming. There are also interesting differences in the manner in which they were employed. From these findings of differences between the two traditions of paintings, it becomes quite clear that while there is a basic similarity especially between Ajanta and Sigiriya as compared to other sites of the island in the matter of preparing the ground, there are also significant differences that indicate different traditions. The most important finding, in this regard is the use of oil by the Sri Lankan painters. Unlike at Ajanta, at Sigiriya and elsewhere in Sri Lanka a gum and a drying oil have been incorporated in the mix. At Ajanta, only glue had been used as a binding medium although in other sites in

234 Of these paintings, one of the best reproductions of a canopy painting is deposited at the National Museum of India, New Delhi.
India vegetable gums have also been used. However, no trace of any kind of oil has been recognised in these investigations at Ajanta and other Buddhist sites of peninsular India where lime seems to be the principal astringent. Hence, the most important technical difference between Ajanta and Sigiriya and the other places of the island is in the binding medium each one favoured. It might be suggested that it is the deviations, such as the use of oil, rather than similarities, which are intrinsic to the technical process and not necessarily borrowed that are significant. But, at the same time it has to be admitted that Indian and Sri Lankan wall paintings, dating from the earliest times till about the end of the 12th century AD are considerably similar as regards the technique of laying the ground and also the pigments employed. This homogeneity of techniques, between the paintings of the two countries may probably be due to the adoption of a common silpa text that we have lost today.

236 See catalogue no 515. 66 of W Spink collection at the photo archives of American Institute of Indian Studies, Gurgaon, Haryana.