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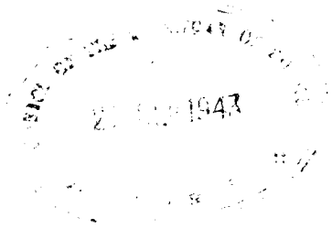

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ALEXANDER'S CAMPAIGN AGAINST PORUS

By

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Of all the enemies of Alexander, the Indian monarch of the Punjab, a Paurava, was the one who offered the stoutest resistance in open battle and earned the sincere admiration of the victor. Though the Paurava lost the battle, he gained Alexander's friendship, and, what is more, he induced in the minds of the Greek soldiers a deep distaste for any further fighting on Indian soil. Alexander said before the battle: 'I see at last a danger that matches my courage' (Curtius VIII, 14). And here is Arrian's account (Anab V, 19) of the meeting between Alexander and Porus after battle: 'He was then conducted to Alexander, who, on learning that Meroës was approaching with him (Porus), rode forward in front of his line with a few of the companions to meet him. Then reining in his horse he beheld with admiration the handsome person and majestic stature of Porus, which somewhat exceeded five cubits. He saw too, with wonder, that he did not seem to be broken and abased in spirit, but that he advanced to meet him as a brave man would meet another brave man after gallantly contending with another king in defence of his kingdom. Then Alexander, who was the first to speak, requested Porus to say how he wished to be treated. The report goes that Porus said in reply, "Treat me, O Alexander! as befits a king," and that Alexander, being pleased with his answer, replied "For mine own sake, O Porus! thou shalt be so treated, but do thou, in thine own behalf, ask for whatever boon thou pleasest", to which Porus replied that in what he had asked everything was included. Alexander was more delighted than ever with this rejoinder, and not only appointed Porus to govern his own Indians, but added to his original territory another of still greater extent. Alexander thus treated this brave man as befitted a king, and he consequently found him in all respects faithful and devoted to his interests. Such then, was the result of the battle in which Alexander fought against Porus and the Indians of the other side of the Hydaspes'.[1]

1. J. W. M'crindle, *The Invasion of India by Alexander the Great*, (1896) pp. 209, and 109-10.

But in spite of all the help we may derive from the Greek writers who have followed Alexander's contemporaries in their descriptions of his campaign in India, much uncertainty hangs still over the site of this famous battle and over the details of the tactical operations that led up to the finale. Closely connected with the location of the battle-field are the questions of the route followed by Alexander from Taxila to the Hydaspes and the exact point where he crossed the stream to deliver the attack on Porus' army assembled on the opposite bank. All the earlier discussions of these questions were succinctly reviewed by V. A. Smith in Appendix D to his *Early History of India*, and his conclusions held the field till recently. Smith observed: 'Every one is agreed that Alexander must have reached the bank of the Hydaspes either at Jhelam or Jalāpur; no other place can be thought of. Both towns are situated on ancient lines of road commanding ancient ferries.' He examined and refuted the arguments urged by Cunningham in favour of Jalālpur, and drew from the Greek accounts of the night-march of Alexander and the crossing of the river on the eve of the battle, the definite conclusion in favour of the other theory of General Abbot, favoured also by Raverty, that the crossing was effected in the 'vicinity of Bhūnā near the remarkable bend' south-east of Manglā, and that the Karrī plain 'girdled by low hills on the north and east', and about five miles broad at its widest, 'afforded a sufficient, though not excessive space for the battle.' He said that he had 'not the slightest doubt that Alexander marched to the Hydaspes by the shortest and easiest route open to him, that he struck the river at or near Jhelam, where he pitched his camp; that he crossed the stream where it was rocky and narrow, a little below the point where it emerges from the hills; and that the battle with Porus was fought in the Karrī plain.' He also gave a plan of the battle to illustrate its progress as he understood it.

In July 1932 Sir Aurel Stein reopened the discussion in a paper based on a personal inspection of the localities involved; the paper bears the title: *'The Site of Alexander's Passage of the Hydaspes and the Battle with Porus'*, and appears in The Geographical Journal, Vol. LXXX, pp. 30-46 with two maps and five pictures. He said: "Before Mr. Vincent Smith took up the question at Oxford, with quasi-legal acumen but without close study of the ground, the theory put forth by General Alexander Cunningham in his 'Archaeological Survey Report for 1863' held the field"; and he made a vigorous plea on fresh lines in support of

the right identifications reached by 'a kind of true antiquarian instinct' by 'the Nestor of Indian archaeology' who 'had taken pains to study the ground'. On his showing, Cunningham was right in identifying Boukephala, the city founded by Alexander to mark the spot where his famous charger met his fate, with Jalālpur; but instead of making that the place of passage and locating the camp of Alexander lower down the stream as he should have done, he made Jalālpur the camp and looked for the place of passage higher up at Dilawar, apparently not realizing that, in doing so, 'he came into direct conflict with Strabo's definite statement' that Boukephala marked the point where Alexander embarked for his passage.

Soon after, in 1933, a well-known German scholar, Bernhard Breloer, published a monograph on *'Alexanders Kampf Gegen Poros'* illustrated by five photographs, seven plans and a map, and forming Heft 3 of the Bonner Orientalische Studien, herausgegeben von P. Kahle und W. Kirfel. (Verslag Von W. Kohlhammer, Stuttgart, 1932-33). This work is taken up primarily with the elucidation of the course of the battle and the disposition of Porus' forces according to Indian ideas of tactics expounded in the *Arthaśāstra* of Kauṭilya. It contains also a discussion of the crossing of the river and the site of the battle-field. Breloer's book had been printed for the most part before Stein's article in the *Geographical Journal* came to his hands, and so he has added a *Nachtrag* (pp. 194-204) in which he discusses Stein's points with great thoroughness. His conclusion is in favour of the Jhelam-Mangla theory, and definitely against Jalalpur.

I intend first to review the discussion between Stein and Breloer, and then proceed to examine the new reconstruction of the battle of Jhelam offered by Breloer. As all discussion has to be carried on with data drawn from the Greek historians of Alexander's expedition, it would be useful to reproduce here the chief texts bearing on the passage of the Hydaspes before taking up the commentaries on them.

1. *Arrian*, ANABASIS V. 11: There was a headland ascending from the bank of the Hydaspes at a point where the river made a remarkable bend and this was thickly covered with all sorts of trees. Over against it lay an island in the river overspread with jungle, an untrodden and solitary place. Perceiving that this island directly faced the headland, and that both places were wooded and adapted to screen his attempt to cross the river, he decided

to take his army over this way. Now the headland and the island were 150 stadia distant from the great camp.'[2]

V. 12: 'With these troops he marched with secrecy, keeping at a considerable distance from the bank that he might not be seen to be moving towards the island and the headland, from which he intended to cross over to the other side...They so proceeded, that they were not seen by the sentries posted by Porus till they had passed beyond the island, and were not far from the bank'.[3]

V. 13: 'As soon as the soldiers had passed beyond the island, they steered for the bank, being now in full view of the enemy, whose sentinels on seeing their approach galloped off at the utmost speed of each man's horse to carry the tidings to Porus. Meanwhile Alexander was himself the first to disembark, and taking the horsemen who had been conveyed over in his own and the other thirty-oared galleys, he at once formed them into line as they kept landing, for the cavalry had orders to be the first to disembark. At the head of these duly marshalled he moved forward. Owing, however, to his ignorance of the locality he had unawares landed not on the mainland, but upon an island, the great size of which prevented it all the more from being recognised as an island. It was separated from the mainland by a branch of the river in which the water was shallow; but the violent storm of rain which had lasted the most of the night had so swollen the stream that the horsemen could not find the ford, and he feared that the latter part of the passage would be as laborious as the first. When at last the ford was found he led his men through it with difficulty; for the water where deepest reached higher than the breasts of the foot soldiers, and as for the horses their heads only were above the river.'[4]

II *Curtius*: VIII, 13. 'The Macedonians were intimidated not only by the appearance of the enemy, but by the magnitude of the river to be crossed, which, spreading out to a width of no less than four stadia in a deep channel which nowhere opened a passage by fords, presented the aspect of a vast sea. Yet its rapidity did not diminish in proportion to its wider diffusion, but it rushed impetuously like a seething torrent compressed into a narrow bed by the closing in of its banks. Besides, at many points the presence of sunken rocks was revealed where the waves were driven back in eddies.... In the middle of the river were numerous islands to which both the Indians and Macedonians began to swim over, holding their weapons above their heads. Here they would engage in skirmishes, while each king endeavoured from the result of these minor conflicts to gauge the issue of the final struggle....

'Alexander, perplexed how to cross the river, at last devised a plan for duping the enemy. In the river lay an island larger than the rest, wooded and suitable for concealing an ambuscade. A deep hollow, moreover, which lay not far from the bank in his own occupation, was capable of hiding not

2. M'crindle pp. 96-7, Stein p. 33.
3. M'crindle pp. 98-99.
4. *Ibid* pp. 99-100, Stein p. 34.

only footsoldiers but mounted cavalry. To divert, therefore, the attention of the enemy from a place possessing such advantages, (he ordered several feints to be undertaken)....

'The island was now beyond view of the enemy.'[5]

III. Plutarch, *Life of Alexander*, Ch. 60. ✓

'How the war against Porus was conducted he (Alexander) has described in his own letters. He tells us that the river Hydaspes ran between the two camps, and that Porus with his elephants which he had posted with their heads towards the stream, constantly guarded the passage. Alexander himself, day after day, caused a great noise and disturbance to be made in his camp, in order that the Indians might be gradually led to view his movements without alarm. At last, upon a dark and stormy night, he took a part of the infantry and a choice body of cavalry, marched a considerable distance from the enemy, and crossed over to an island of no great size. Here he was exposed with his army to the rage of a violent thunderstorm, amid which rain fell down in torrents, and though he saw some of his men struck dead with the lightning, he nevertheless advanced from the island and reached the furthermost bank of the river. The Hydaspes was now flooded by the rains, and its raging current had chosen a new channel of great width, down which a great body of water was carried. In fording this new bed, he could with difficulty keep his footing, as the bottom was very slippery and uneven. It was here that Alexander is said to have exclaimed, "O Athenians! can you believe what dangers I undergo to earn your applause?" This particular rests on the authority of Onesikritos, for Alexander himself merely says that he and his men left their rafts, and under arms waded through the second torrent with the water up to their breasts'.[6]

The genuineness of the letters of Alexander on which Plutarch's account is based has often been called in question, and according to Arrian and Curtius, the storm had subsided before the crossing to the island began.

Stein says that a close examination of the ground on the eastern bank of the river near Jhelam town 'conclusively proved that the battle with Porus could not possibly have been fought there as assumed by Abbot and Vincent Smith'. There are too many marshy flood beds for over four miles up the river, and quicksands form a more or less permanent feature of the terrain. The difficulty of this ground over which Porus' troops with chariots and elephants could not possibly have been moved, and the narrowness of the plain nowhere more than 3½ miles across to the

5. M'crindle pp. 204-206.
6. M'crindle p. 307.

hills whereas Arrian's figures would necessitate a front line of much more than four miles for Porus' battle array, are the main topographical facts on the basis of which Stein rejects the Jhelam-Mangla theory. It will become clear presently that independently of Stein's criticisms thus briefly summarised, Breloer has proposed an alternative reconstruction of the battle array of Porus and of the course of tactical operations in its progress which, if accepted as correct, would obviate the objection on the score of the narrowness of the Karrī plain.

The rest of Stein's article is devoted to a demonstration of how the data given by our sources regarding the crossing suits the Jalalpur site better than that of Jhelam-Mangla. These arguments have been traversed by Breloer in the Appendix to his monograph and I can easily do worse than reproduce the substance of his criticisms, for that is the simplest way of placing the reader in possession of the views of the two protagonists of the rival theories.

Besides the exact site of the battle-field which we have reserved for further consideration at a later stage, discussion has to centre round two questions.—that of the route followed by Alexander from Taxila, and that of the place of crossing the river Hydaspes. The argument has to proceed on the basis that no great change has taken place in the course of this part of Jhelam river since Alexander's time which is quite probable. Stein says that Alexander's route lay across the salt range in the line of Ara-Bhaganwala—Dhariala—Haranpur to the Jhelam river which he struck at a point about 17½ miles below Jalālpur. Breloer observes that this view rests primarily on the importance attained in the middle ages by the Nandana fort between Baghanwala and Ara; this fort was attacked by Mahmud of Ghazni in A.D. 1014 and its last Shahiya ruler put to flight. But then the Shahiya was in possession of the Salt Range, and Mahmud's operations were confined to the west of the Jhelam river. It is reasonably certain that this region was held by Taxiles, a friend of Alexander, at the time of the campaign against Porus; the river Jhelam is clearly said to have been the boundary between the kingdoms of the two princes, and Alexander had to cross the river to deliver his attack.

In fact Jhelam town and Jalalpur are the only two points on the river by which roads pass from Taxila across the Salt Range to the Ganges valley, and modern railway tracks follow just these routes. The historical data are not quite decisive as between them; both are ancient routes, and neither Strabo's statement that Alexander's route from Taxila to the Jhelam lay more to the south and thence more to the east, nor Pliny's figure of 120 Roman miles for the distance traversed by Alexander in the march from Taxila to the Jhelam is as conclusive in this respect as Stein seems to think.

Strategic considerations are to my mind no more conclusive, though Breloer holds that they favour very decidedly the Jhelam-Mangla theory. Stein argues, as already noted, that the terrain on the left bank of the river opposite Jhelam town affords no good field for the battle, that Porus is not likely to have chosen it, and that he would much rather have fixed his camp on the 'absolutely open and flat ground' opposite Haranpur (p. 43). Breloer's criticism of this point runs as follows: 'The notion that Porus could prescribe the field of battle to Alexander is very widespread, but on that account by no means well-founded. Alexander is the aggressor, and his objective was not to capture any particular point like a fortress, but the crossing of the river. He himself could thus choose the place most convenient to him and inconvenient to his enemy, not the other way round as Sir Marc Aurel Stein thinks' (p. 197). But this criticism overlooks the testimony of our sources that Porus had already taken up his position on the left bank of the river when Alexander reached it, so that his movements had to be adjusted to the initial choice of Porus. Thus Arrian: 'Alexander encamped on the banks of the river, and Porus was seen on the opposite side, with all his army and his array of elephants around him' (V, 9, p. 94); and Curtius: Alexander 'advanced till he reached the river Hydaspes, where on the further bank Porus *had encamped to prevent the enemy from landing*' (viii, 13 pp. 203-4). Breloer argues further that if Porus had encamped opposite Jalalpur (Haranpur), he would have left the way open to Alexander to win the left bank easily by the Jhelam ford, while if Porus had fixed his camp opposite Jhelam town, Alexander would not choose the Jalalpur crossing as that would leave Porus free to join forces with Abhisares and block his return to Taxila. I am unable to attach any weight to this argument; the facts are that wherever Porus had fixed his camp, Alexander did cross the stream about seventeen miles above that point, and that even when the enemy had effected the crossing and was moving against him, Porus could imagine for a time that it was his friend Abhisares coming to his aid.[7]

7. Curtius, viii, 14.

Breloer urges other general considerations in favour of the Jhelam site, and the advantages it offered both to Porus and to Alexander from their respective points of view, and the tactical advantages offered by the inner and outer sectors of the entire ground between the forts Rhotas and Mangla. But these considerations, in so far as they are concrete and valid, come up again in his detailed discussion of the data drawn from the sources regarding the crossing place, and to this discussion we may now turn our attention. These data comprise eight 'criteria' as Breloer calls them. They are the following:

1. The headland (Arrian)—Stein finds this in a height immediately to the west of Jalalpur. But Arrian says that this headland rose from the river bank. At Jalalpur, however, the river is far from the headland, and even the small arm of it, the Halkiwani Nala, which has water only from April to August, lies nearly a mile to the south-east of Jalalpur. There is no such difficulty on the Mangla-theory, and the headland on the bank at the point where the river makes a remarkable bend can be seen to this day opposite fort Mangla exactly as Arrian describes it. Even Abbot who sought the headland elsewhere (a little lower down the river near Bhuna) described correctly 'the solid cliff on the western bank opposite the fort of Mangla.' (Br. p. 137).

2. The ravine or 'deep hollow' (Curtius)-Stein says: 'Immediately to the east of it (Jalalpur) there lies the winding mouth of the Kandar Kas. a torrent bed with sandy bottom, descending from the range and joining the river. Within less than a mile then passes a northern branch of the Jhelam, carrying much water at the time of the summer floods and known as the Halkiwani Nala' (p. 41). Breloer remarks on this that according to his map the bed of this Kas near the headland is something like thirty feet higher than the river bed, that if the Halkiwani Nala had water only from April to August, the Kandar Kas would have it only when all Nalas had it i.e. immediately after a rainfall, and that at other times its sandy bed could hardly afford a convenient path for a considerable expeditionary force which had important military objectives before it.

Quite otherwise on the Mangla theory, the bed of the Potha wala Kas is not sandy, the watercourse tolerably small, the direction

parallel to the course of the river, the mouth itself hidden from view and forming a creek near by filled with the river water at the melting of snow.

So far, the criteria apply to both the theories though with greater appositeness to the Jhelam theory according to Breloer; but the remaining criteria from the sources are such as to rule Jalalpur out altogether; that is if we assume as we reasonably may, that the texts are fairly accurate as we have them and that there have been no great changes in the course of the Jhelam river in this part of its course.

3. The bend in the course of the river (Arrian). A remarkable bend in the river such as Arrian speaks of we seek for in vain at Jalalpur; whereas near Mangla the river makes almost a right angle, and this in the immediate vicinity of the headland.

4. The channel (Arrian, Plutarch)—Stein points to a channel formed since the last survey of the area made twenty years before his visit; Smith seems also to have thought that Alexander's channel as he calls it separating the great island from the mainland, owed its origin to some accident of a like nature. Such canals come into existence and disappear with every flood. On the other hand, the Jabar Nala on the Jhelam site which is missing in Stein's map at p. 32 owes its origin to no accident but to the natural lie of the land; the water from the mountain chain cannot reach the river bed directly on account of a land ridge in between, and makes its way along a narrow channel parallel to the river, and this channel must have been there two thousand years ago performing the same function.

5. The small island (Arrian). Arrian mentions two islands in the bed of the river, one he calls simply an island, lonely and wooded, which Breloer calls 'the small island' for purposes of discussion; the other is the large island which Alexander at first took for the mainland before he came to the channel. When Curtius speaks of the ravine and the island, we do not know which of the two islands of Arrian he has in view. Stein assumes the possibility of changes in the islets in the river, and points to an island, Adamana, opposite Jalalpur, which is not in the bed of the river but across a dry channel, and, far from being lonely and uninhabited, is quite fertile and populous. On the Mangla site we still have an island in the bed of the river, lonely and uninhabited, though now it is no longer wooded.

6. The large island (Arrian)—Stein does not seem to consider this an essential factor in the determination of the site, though he writes: 'we crossed the sandy main bed of the river from the point where the Halkiwani joins it and found it nearly a mile wide. But apart from large pools it held water only in one shallow channel about 250 yards across at the time. Then we passed for close on a mile over ground which had all the appearance of mainland, being in part treated as "Reserve Forest" area, before we came unexpectedly upon a channel with flowing water only 50 yards across. Shallow at the time (close of November), it was said to be quite unfordable during the time of the summer floods. It had obviously formed since the last survey was made in this area some twenty years ago' (p. 43).

At Mangla, the great island is in fact mainland, the channel is really an affluent which has two mouths leading into the river and no real arm of the river; it fills with river water during summer floods. In fact a large 'island' is hard to find in the whole course of the river.

7. The distance of the camp from the crossing place. Stein objects to Smith's version of the Jhelam theory which postulates the crossing at Bhuna by pointing out as grave objections to it 'the absence at Bhuna of anything in the shape of a headland ascending from the bank of the river and (or) the fact that the distance from Jhelam to Bhuna is only about 10 miles instead of the 17½ miles mentioned by Arrian between Alexander's camp and the headland' (p. 39). He says this further in support of his own location of the camp at Haranpur. 'Ten miles across the alluvial plain below Bhaganwala bring us to that point near the village of Haranpur where the Jhelam, flowing in a single well-defined bed, offers a particularly convenient crossing place. This is proved also by the position of the bridge over which the Sind-Sagar branch of the North-Western Railway here passes the river. It is here that we may look for the place where Porus guarded the river passage and where Alexander's main camp stood facing that of his adversary.

'I have already had occasion to point out that the road distance between Haranpur and Jalalpur corresponds exactly to the 17½ miles recorded by Arrian between Alexander's camp and the place where his passage of the Hydaspes took place. It only remains to add that, as the map shows the present road between the two places runs at such a distance from the river as would

have effectively screened the final move of Alexander's force from the enemy's observation, a point specially mentioned by Arrian' (pp. 45-6).

Breloer makes the following observations: 'The distance from Haranpur to Jalalpur is indeed 17 miles. The ferry lies according to my map 5½ miles further down.[8] The conditions of the river at the point where the railway bridge passes it are not known. If Alexander took this route in the night, he could not have marched so far from the bank as to have remained unnoticed by the enemy.[9]

'The way from Jhelam to Mangla is also 17 miles on the map. There, however, the river makes a great bend and the road lies far from the stream.' (Sketch and map).

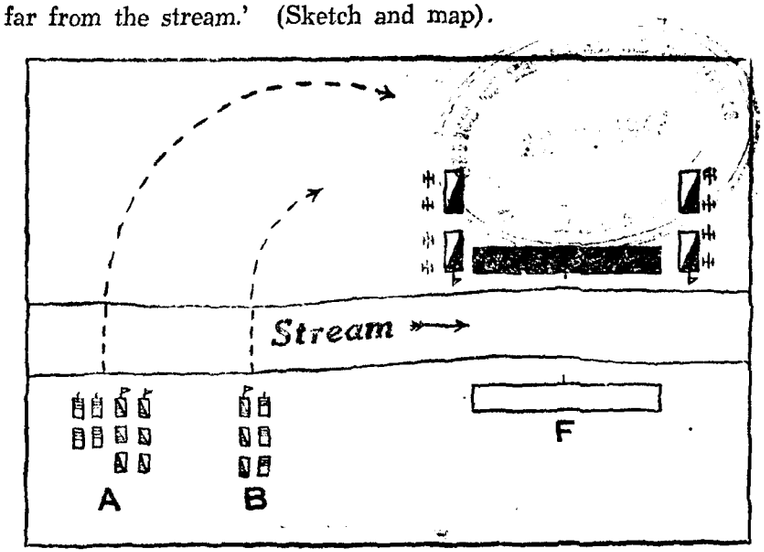


Fig. I.

F. Krateros' front. Camp of Alexander, opposite the camp of Poros with conjectual distribution of cavalry and chariots on the wings.

A. The landing force of Alexander with indication of the direction of operation. 5,000 cavalry and 6,000 infantry.

B. The reserve under Meleager, Attalos, and Gorgias, which had orders to go over to the field and take part in it.

(After Breloer).

8. There is a ferry marked in Stein's map also at the point mentioned by Breloer.

9. A point expressly affirmed by Stein.

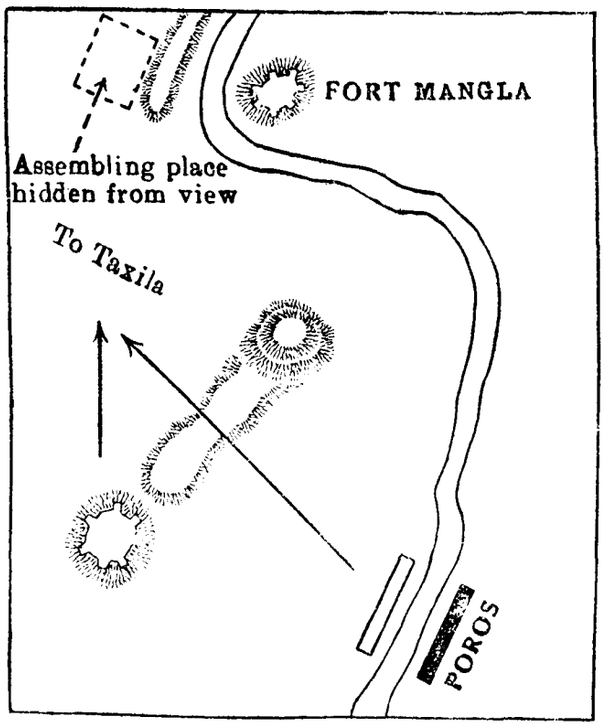


Fig. II Field of operations (general view).

(*After Breloer*).

8. The position of the reserve. Stein has not noticed this particularly. In the Mangla theory the group of hills in the field of operations between Jhelam and Mangla indicate clearly the reason and purpose of the reserve being left midway between the camp and the crossing point.

This detailed examination of the relative merits of the two theories in the light of the texts, thinks Breloer, results in the definite superiority of the Jhelam theory, and on the whole I am inclined to agree with him.

At the risk of being tautologous, I may stress the fact that the discussion has centred round the new and modified versions of the two theories put forward by Breloer (Jhelam-Mangla) and Stein (Jalalpur-Haranpur), and that in the forms in which these theories were left by Smith and Cunningham, neither the Mangla

fort nor the Haranpur village played any part. Doubtless in either case the revised versions meet the demands of the texts better.

* * * * * * * *

We may now turn to the course of the actual battle, and once more start with the main texts on the subject. We need not concern ourselves with the initial skirmish at the landing place between the detachment sent by Porus under his son and the cavalry of Alexander. Accordingly I omit this episode in the reproduction of the texts and confine myself to the disposition of forces on either side and the progress of the main battle.

I. *Arrian*, V Chh. 13, 14, 15-18

Ch. 13—'When Alexander had crossed this piece of water also, he selected the mounted corps of body-guards, and the best men from the other squadrons of cavalry, and brought them from column into line upon the right wing. Then in front of all the cavalry he posted the horse archers, and next in line to the cavalry and in front of all the infantry the royal hypaspists commanded by Seleukos. Next to these again he placed the royal foot guards and then the other hypaspists, each in what happened to be the order of his precedence for the time being. At each extremity of the phalanx were posted the archers and the Agrianians and the javelin men.'

Ch. 14—'Alexander having made these dispositions, ordered the infantry, which numbered nearly 6,000 men, to follow him at the ordinary marching pace and in regular order, for when he saw that he was superior in cavalry, he took with himself only the horsemen, about 5,000 in number, and led them forward at a rapid pace. Taurôn, the captain of the archers, he ordered to hasten forward with his men to give support to the cavalry. He had come to the conclusion that if Porus engaged him with all his troops he would either, without difficulty, overpower him by charging with his cavalry, or would remain on the defensive till the infantry came up during the action, or that if the Indians terrified by the marvellous audacity of his passage of the river, should take to flight, he would be able to pursue them closely, and the slaughter being thus all the greater there would not be left much more work for him to do.....

Ch. 15—' ..... When the horsemen who had escaped from this (initial) rout reported one after another to Porus that Alexander himself had crossed the river with the strongest division of his army, and that his son had been slain, in the fight, he was still at a loss what to determine, for the division which had been left with Krateros in the great camp right opposite to his own position appeared to be undertaking the passage, but he at last decided to march with all his forces against Alexander and fight it out with the strongest division of the Macedonians led by the king in person. He nevertheless left there in his camp a few of the elephants and a small force to deter the cavalry under the command of Krateros from landing. He then took all his cavalry, 4,000 strong, all his chariots, 300 in number, 200 of his

elephants, and 30,000 efficient infantry, and marched against Alexander. When he found a place where he saw there was no clay, but that the ground from its sandy nature was all flat and firm, and suited for the movements of cavalry whether charging or falling back, he then drew up his army in order of battle, posting his elephants in the front line at intervals of at least 100 feet, so as to have his elephants ranged in front before the whole body of his infantry, and so to spread terror at all points among Alexander's cavalry. He took it for certain besides that none of the enemy would have the audacity to push in at the intervals between the elephants—not the cavalry since their horses would be terrified by these animals, and much less the infantry, since they would be checked in front by his heavy-armed foot soldiers falling upon them, and trampled down when the elephants wheeled round upon them. Behind these he drew up his infantry, which did not close up in one line with the elephants, but formed a second line in their rear, so that the regiments were only partly pushed forward into the intervals. He had also troops of infantry posted on the wings beyond the elephants, and on both sides of the infantry the cavalry had been drawn up, and in front of it the chariots.

Ch. 16—'In this manner had Porus arranged his troops. As soon as Alexander perceived that the Indians had been drawn up in battle order he made his cavalry halt, that he might get in hand each regiment of the infantry as it came up; and even when the phalanx by a rapid march had effected a junction with the cavalry he still at once did not marshal its ranks and lead it into action, and thus expose the men, while tired and out of breath, to the Indians, who were quite fresh, but he gave them time, while he rode round their ranks, to rest until they could recover themselves. When he had observed how the Indians were arranged he made up his mind not to advance against the centre, in front of which the elephants had been posted, while the intervals between them had been filled with compact masses of infantry for he feared lest Porus should reap the advantage which he had calculated on deriving from the arrangement. But as he was superior in cavalry he took the greater part of that force, and marched alone towards the left wing of the enemy to make his attack in this quarter. Koinos he sent at the head of his own regiment of horse and that of Demetrios to the right, and ordered him, when the Indians, on seeing what a dense mass of cavalry was opposed to them, should be riding along to encounter it, to hang close upon their rear. The command of the phalanx of infantry he committed to Seleukos, Antigenes and Tauron, who received orders not to take part in the action till they saw that the phalanx of infantry and the cavalry of the enemy were thrown into disorder by the cavalry under his own command.

'When the Indians were now within reach of his missiles he despatched against their left wing the horse archers, who were 1,000 strong, to throw the enemy in that part of the field into confusion with storms of arrows and charges of their horses. He marched rapidly forward himself with the companion cavalry against the left wing of the Indians, making haste to attack their cavalry in a state of disorder while they were still in column, and before they could deploy into line.

Ch. 17—'The Indians meanwhile had collected their horsemen from every quarter, and were riding forward to repulse Alexander's onset, when Koinos, in accordance with his orders, appeared with his cavalry upon their rear. Seeing this the Indians had to make their cavalry face both to front and rear—the largest and best part to oppose Alexander, and the remainder to wheel round against Koinos and his squadrons. This therefore at once threw their ranks into confusion, and disconcerted their plan of operations; and Alexander, seeing that now was his opportunity while their cavalry was in the very act of forming to front and rear, fell upon those opposed to him with such vigour that the Indians unable to withstand the charge of his cavalry, broke from their ranks, and fled for shelter to the elephants as to a friendly wall. Upon this the drivers of the elephants urged these animals forward against the cavalry; but the Macedonian phalanx itself now met them face to face, and threw darts at the men on the elephants, and from one side and the other struck the elephants themselves as they stood around them. This kind of warfare was different from any of which they had experience in former contests, for the huge beasts charged the ranks of the infantry, and wherever they turned went crushing through the Macedonian phalanx though in close formation; while the horsemen of the Indians, on seeing that the infantry was now engaged in the action, again wheeled round and charged the cavalry. But Alexander's men, being far superior in personal strength and military discipline, again routed them, and again drove them back upon the elephants, and cooped them up among them. Meanwhile the whole of Alexander's cavalry had now been gathered into one battalion, not in consequence of an order, but from being thrown together in the course of the struggle, and wherever they fell upon the ranks of the Indians they made great carnage before parting from them. The elephants being now cooped up within a narrow space, did no less damage to their friends than to their foes, trampling them under their hoofs as they wheeled and pushed about. There resulted in consequence a great slaughter of the cavalry, cooped up as it was in a narrow space around the elephants. Many of the elephant drivers, moreover, had been shot down, and of the elephants themselves some had been wounded, while others, both from exhaustion and the loss of their mahouts no longer kept to their own side in the conflict, but as if driven frantic by their sufferings, attacked friend and foe quite indiscriminately, pushed them, trampled them down, and killed them in all manner of ways. But the Macedonians, who had a wide and open field, and could therefore operate as they thought best, gave way when the elephants charged and when they retreated followed at their heels and plied them with darts, whereas the Indians, who were in the midst of the animals, suffered far more the effects of their rage. When the elephants, however, became quite exhausted, and their attacks were no longer made with vigour they fell back like ships backing water, and merely kept trumpeting as they retreated with their faces to the enemy. Then did Alexander surround with his cavalry the whole of the enemy's line, and signal that the infantry, with their shields linked together so as to give the utmost compactness to their ranks, should advance in phalanx. By this means the cavalry of the Indians was, with a few exceptions, cut to pieces in the action. Such also was the fate of the infantry, since the Macedonians were now pressing upon them

from every side. Upon this all turned to flight wherever a gap could be found in the cordon of Alexander's cavalry'.

Ch. 18—'Meanwhile Krateros and all the other officers of Alexander's army, who had been left behind on the opposite bank of the Hydaspes, crossed the river when they perceived that Alexander was winning a splendid victory. These men, being fresh were employed in the pursuit, instead of Alexander's exhausted troops, and they made no less a slaughter of the Indians in the retreat than had been made in the engagement....'[10]

II. Curtius, *viii*, 13-14.

Ch. 13—'.. Alexander..advanced till he reached the river Hydaspes, where on the further bank Porus had encamped to prevent the enemy from landing. In the van of his army he had posted 85 elephants of the greatest size and strength, and behind these 300 chariots and somewhere about 30,000 infantry, among whom were the archers, whose arrows, as already stated, were too ponderous to be readily discharged. He was himself mounted on an elephant which towered above all its fellows, while his armour, embellished with gold and silver, set off his supremely majestic person to great advantage.

..The bank presented a still more formidable aspect for, as far as the eye could see, it was covered with cavalry and infantry, in the midst of which, like so many massive structures, stood the huge elephants, which, being of set purpose provoked by their drivers, distressed the ear with their frightful roars. The enemy and the river both in their front, struck with sudden dismay the hearts of the Macedonians, disposed though they were to entertain good hopes, and knowing from experience against what fearful odds they had ere now contended....

'Alexander then gave orders that his own tent should be pitched on a part of the bank looking the other way, that the guard of honour which usually attended him should be posted before it, and that all the pageantry of royal state should be paraded before the eyes of the enemy on purpose to deceive them. He besides requested Attalus, who was about his own age, and not unlike him in form and feature, especially when seen from a distance, to wear the royal mantle, and so make it appear as if the king in person was guarding that part of the bank without any intention of crossing the river....'

Ch. 14—'He (Alexander) was already in full march at the head of his army, which he had divided into two columns, when the tidings reached Porus that the bank was occupied by a military force, and that the crisis of his fortunes was now imminent. In keeping with the infirmity of our nature, which makes us ever hope the best, he at first indulged the belief that this was his ally Abhisares come to help him in the war as had been agreed upon. But soon after, when the sky had become clearer, and showed

10. M'crindle, *Invasion*, pp. 100-107.

the ranks to be those of the enemy, he sent 100 chariots and 4,000 horse to obstruct their advance. The command of this detachment he gave to his brother Hages.[11]..

"A few (horses) which were driven off the field by the darts of the enemy made their way to Porus, who was making most energetic preparations for the contest. As soon as he saw his chariots scattered amid his ranks, and wandering about without their drivers he distributed his elephants to his friends who were nearest him. Behind them he had posted the infantry and the archers and the men who beat the drums, the instruments which the Indians use instead of trumpets to produce their war music. The rattle of these instruments does not in the least alarm the elephants, their ears, through long familiarity, being deadened to the sound. An image of Hercules was borne in front of the line of infantry, and this acted as the strongest of all incentives to make the soldiers fight well. To desert the bearers of this image was reckoned a disgraceful military offence, and they had even ordained death as a penalty for those who failed to bring it back from the battle-field, for the dread which the Indians had conceived for the god when he was their enemy had been toned down to a feeling of religious awe and veneration.

"The sight not only of the huge beasts, but even of Porus himself, made the Macedonians pause for a time, for the beasts, which had been placed at intervals between the armed ranks, presented, when seen from a distance, the appearance of towers, and Porus himself not only surpassed the standard of height to which we conceive the human figure to be limited, but, besides this, the elephant on which he was mounted seemed to add to his proportions, for it towered over all the other elephants even as Porus himself stood taller than other men. Hence Alexander, after attentively viewing the king and the army of the Indians, remarked to those near him, "I see at last a danger that matches my courage. It is at once with wild beasts and men of uncommon mettle that the contest now lies". Then turning to Coenus, "When I," he said "along with Ptolemy, Perdiccas, and Hephaestion, have fallen upon the enemy's left wing, and you see me in the heat of the conflict, do you then advance the right wing and charge the enemy when their ranks begin to waver. And you sirs', he added, turning to Antigenes, Leonnatus, and Tauron, "must bear down upon their centre, and press them hard in front. The formidable length and strength of our pikes will never be so useful as when they are directed against these huge beasts and their drivers. Hurl, then, their riders to the ground, and stab the beasts themselves. Their assistance is not of a kind to be depended on, and they may do their own side more damage than ours for they are driven against the enemy by constraint, while terror turns them against their own ranks."

11. According to Arrian this force was commanded by the son of Porus—M'crindle. The accounts of this preliminary engagement have been omitted

"Having spoken thus he was the first to put spurs to his horse. And now, as has been arranged, Coenus, upon seeing that Alexander was at close quarters with the enemy, threw his cavalry with great fury upon their left wing. The phalanx besides, at the first onset, broke through the centre of the Indians. But Porus ordered his elephants to be driven into action where he had seen cavalry charging his ranks. The slow-footed unwieldy animals however, were unfitted to cope with the rapid movements of horses, and the Indians were besides unable to use even their arrows. These weapons were really so long and heavy that the archers could not readily adjust them on the string unless by first resting their bow upon the ground. Then, as the ground was slippery and hindered their efforts, the enemy had time to charge them before they could deliver their blows.

"The king's authority was in these circumstances unheeded, and, as usually happens when the ranks are broken, and fear begins to dictate orders more peremptorily than the general himself, as many took the command upon themselves as there were scattered bodies of troops. Some proposed that these bodies should unite, others that they should form separate detachments, some that they should wait to be attacked, others that they should wheel round and charge the enemy in the rear. No common plan of action was after all concerted. Porus, however, with a few friends in whom the sense of honour was stronger than fear, rallied his scattered forces, and marching in front of his line advanced against the enemy with the elephants. These animals inspired great terror, and their strange dissonant cries frightened not only the horses, which shy at everything, but the men also, and disordered the ranks, so that those who just before were victorious began now to look round them for a place to which they could flee. Alexander thereupon despatched against the elephants the lightly-armed Agrianians and the Thracians, troops more serviceable in skirmishing than in close combat. They assailed the elephants and their drivers with a furious storm of missiles, and the phalanx, on seeing the resulting terror and confusion, steadily pressed forward.

"Some, however, by pursuing too eagerly, so irritated the animals with wounds that they turned their rage upon them, and they were in consequence trampled to death under their feet, thus warning others to attack them with greater caution. The most dismal of all sights was when the elephants would, with their trunks, grasp the men, arms and all, and hoisting them above their heads, deliver them over into the hands of their drivers. Thus the battle was doubtful, the Macedonians sometimes pursuing and sometimes fleeing from the elephants, so that the struggle was prolonged till the day was far spent. Then they began to hack the feet of the beasts with axes which they had prepared for the purpose, having besides a kind of sword somewhat curved like a scythe, and called a chopper, wherewith they aimed at their trunks. In fact, their fear of the animals led them not only to leave no means untried for killing them, but even for killing them with unheard-of forms of cruelty.

"Hence the elephants, being at last spent with wounds, spread havoc among their own ranks, and threw their drivers to the ground, who were

then trampled to death by their own beasts. They were therefore driven from the field of battle like a flock of sheep, as they were maddened with terror rather than vicious. Porus, meanwhile being left in the lurch by the majority of his men, began to hurl from his elephant the darts with which he had beforehand provided himself, and while men were wounded from afar by his shot he was himself exposed as a butt for blows from every quarter. He had already received nine wounds before and behind, and became so faint from the great loss of blood that the darts were dropped rather than flung from his feeble hands. But his elephant, waxing furious though not yet wounded kept charging the ranks of the enemy until the driver, perceiving the king's condition—his limbs failing him, his weapons dropping from his grasp, and his consciousness almost gone—turned the beast round and fled.'[12]

III. Diodorus of Sicily, XVII 87-88.

Ch. 87—"..Thereafter Alexander, who had recruited his army by an interval of rest in the country of Taxiles, took the field against Porus, the king of the neighbouring Indians, who had an army of more than 50,000 foot, about 3,000 horse, above 1,000 chariots, and 130 elephants. This king had made an alliance with another prince called Embisaros, the ruler of an adjacent tribe, and who possessed an army which was but little inferior to his own. Alexander, on learning that this king was 400 stadia distant, resolved to attack Porus before his ally could reach him. Porus, being warned of the near approach of the enemy, at once drew up his troops in order of battle. His cavalry he distributed on the wings, and his elephants he placed in his front line at equi-distances, and so arranged as to strike the enemy with terror. In the intervals between the animals he stationed the rest of his soldiers, instructing them to succour the elephants and protect them from being assailed in flank by the enemy's missiles. The whole disposition of his army gave it very much the appearance of a city—the elephants as they stood resembling its towers, and the men at arms placed between them resembling the lines of wall intervening between tower and tower. But Alexander, having observed how the forces of the enemy had been disposed, regulated thereby the formation of his own line.

Ch. 88.—"The Macedonian cavalry began the action, and destroyed nearly all the chariots of the Indians. Upon this the elephants, applying to good use their prodigious size and strength, killed some of the enemy by trampling them under their feet, and crushing their armour and their bones, while upon others they inflicted a terrible death, for they first lifted them aloft with their trunks, which they had twined round their bodies, and then dashed them down with great violence to the ground. Many others they deprived in a moment of life by goring them through and through with their tusks. But the Macedonians heroically bore the brunt of this dreadful onslaught, and having killed with their long pikes the men stationed between the elephants, made the poise of the battle equal. They next assailed the

12. M'crindle, *Invasion* pp. 203-212.

animals themselves with a storm of javelins, thus piercing them with numerous wounds, which so tortured them that the Indians mounted on their backs lacked sufficient strength to control their movements, for the animals on heading to their own ranks bore against them with an impetuosity not to be repressed, and trampled their own friends under their feet. Then ensued a great confusion, but Porus, who was mounted on the most powerful of all his elephants, on seeing what had happened, gathered around him forty of the animals that were still under control, and falling upon the enemy with all the weight of the elephants, made a great slaughter with his own hand, for he far surpassed in bodily strength any soldier of his army. In stature he measured five cubits, while his girth was such that his breast-plate was twice the size required for a man of ordinary bulk. For this reason the javelins he flung from his hand flew with all but the impetus of shots from a catapult. The Macedonians who stood opposed to him being terror struck at his astonishing prowess, Alexander sent to their assistance the archers and the divisional light troops, with orders that every man should make Porus the object of his aim. The soldiers lost no time in carrying out these orders. Their bolts flew thick and fast, and as the Indian king at whom they were all aimed presented a broad mark, none of them failed to carry home. Porus fought on with heroic courage, but being drained of blood by the number of his wounds, he fainted away, and leaning on his elephant for support was borne to the ground. A report having spread that their king was dead, the remnant of the Indian host fled from the field, but many of them were slain in the flight."[13]

IV. Plutarch: *Life of Alexander*, Ch. 60 (continuation of passage cited earlier).

"After crossing, he (Alexander) himself rode forward about twenty stadia in advance of the infantry, concluding that if the enemy attacked him with their cavalry only, he could easily rout them; but if they moved forward their entire force, he could bring his infantry into the field before fighting began. He was right in both conclusions, for he fell in with 1,000 horse and 60 war-chariots of the enemy, and these he routed, capturing every chariot, and slaying 400 of the horsemen. Porus thus perceived that Alexander himself had crossed the river, and he therefore advanced against him with all his army, except some troops which he left to guard his camp, in case the Macedonians should cross from the opposite bank to attack it. Alexander, dreading the elephants and the great numbers of the enemy, did not engage with them in front, but attacked them himself on the left wing, ordering Koinos to fall upon them on the right. Both wings were broken, and the enemy, driven from their position, thronged always towards the centre where the elephants were posted. The contest, which began early in the morning, was so obstinately maintained that it was fully the eighth hour of the day before the Indians renounced all attempts at further resistance.

13. M'crindle, *Invasion* pp. 274-276.

This description of the battle is given by the chief actor in it himself in his letters."[14]

These are all the most important texts; for all the details they give, they still leave room for alternative reconstructions of the course of the battle; Arrian's description is on the whole the most business-like and least obscure, but even from Arrian the position and part assigned to Koinos is not clear beyond the reach of doubt. There is no need to follow the discussions of commentators in all their detail here. Two views have been taken of the role of Koinos. The first is that he was asked to post himself opposite Porus' right wing, and then attack his cavalry in that section in the rear if they were ordered, as was expected, to go over to the left wing to support the cavalry there in its resistance against the onslaught led by Alexander himself. On this view Alexander opens the battle with a cavalry attack on Porus' left wing, Porus orders the cavalry division on his right wing to come to its help behind the main line of elephants and infantry, and Koinos already stationed opposite the right wing cavalry of Porus falls upon them in the rear when they start the movement to the left. One objection has been raised; 'had he (Koinos) been detached to oppose the right wing of Porus he would have been too far off to support Alexander's front attack by an attack on the enemy's rear'.[15] And Arrian is by no means clear about the exact position of Koinos. He says that Alexander sent Koinos to the right, and ordered him to hang close upon the rear of the Indian horse when they rode along to encounter Alexander (Ch. 16). Had this statement stood alone there could have been no question of Porus' cavalry on his right wing coming into play, and consequently none also of Koinos taking position against the right wing of Porus. But Arrian begins his seventeenth chapter with the statement: 'The Indians meanwhile had collected their horsemen *from every quarter*, and were riding forward to repulse Alexander's onset, when Koinos, in accordance with his orders, appeared with his cavalry upon their rear'. In view of this sentence, the course of events is clearly as follows: Porus at first disposes of his cavalry in two sections one on the right wing, and one on the left; Alexander's attack is delivered on the left wing; Porus gathers his horsemen *from every quarter* to oppose Alexander, that is, to repulse the attack on the

14. M'crindle, *Invasion* pp. 307-8.
15. Kochly and Rüstow as cited by M'crindle in *Invasion* p. 104 n.2.

left wing; which means that Porus right wing cavalry moved to the support of the left wing, and then Koinos appeared in their rear. That is the case for the view that Koinos was asked to post himself against the right wing of Porus. This is the view that has commended itself to most writers including Vincent Smith and they describe the battle accordingly.

The other view is that Koinos was sent to the Macedonian right so that both he and Alexander together dealt with the Indian cavalry posted in the left wing of Porus' array. One of the exponents of this view cited by M'crindle (p. 360) writes: "The situation is this: Alexander was not himself in position on the right wing, but put Koinos there with some of the cavalry, while he himself with the main body made the flanking movement. This he did with speed, so as to take the Indian horse in flank, before they had time to change their front and meet him. They tried to execute this movement, but had not time; and while they were in the confusion thus brought about, Koinos fell upon what had been their front, but was now their disordered flank". This writer is indifferent to the part of the right wing cavalry of Porus, and says: 'whether the Indian horse from their right wing was brought over to succour that on their left or not, does not affect the probable position of Koinos'. According to him the only difficulty in the way of this explanation is the presence of war-chariots in front of the Indian horse, and this objection is met by Diodorus' statement (XVII 88) that the Macedonian cavalry began the action and destroyed nearly all the chariots of the Indians. But to my mind the more serious objection to this view is that it belittles the part of Porus' right wing while Arrian seems to be particularly inclined to emphasise it in the manner noticed above. Plutarch also seems to stress this, though the authenticity of his ostensible source, the letters of Alexander, has been called in question. Plutarch says: 'Alexander..... attacked them himself on the left wing, ordering Koinos to fall upon them on the right.' The balance seems to be on the whole in favour of the view that Koinos was asked to support Alexander's attack on the left wing by hampering the right wing of Porus going to its aid. The only other important feature of the battle was an attack on the front by the phalanx when the confusion started on the wings began to spread to it; on this all writers are agreed.

In his study of the battle Breloer bases himself more on Curtius than on Arrian, because while according to Breloer, Curtius

makes intelligent and cogent use of his sources, Arrian merely puts them together unintelligently—(pp. 100,105)—a judgment which I find it difficult to share. Directly contrary to Arrian's explicit statement, Breloer holds that Porus did not march out of his camp to meet Alexander's forces, but only realigned his troops, and changed his front.[16] Curtius' account makes it clear that the main camp of Porus on the river bank and the battle front formed one single tactical unit not separated by any great distance to be covered by a long march on the part of Porus. (p. 112). Porus was so completely taken in by the camouflage of Alexander, that to a late hour he thought he saw Alexander on the opposite bank in the Greek camp and expected the main attack to be made frontally across the river; the troops advancing on his own side of the river he took at first to be those of his ally Abhisares of Kashmir and Hazara. And this is an index, according to Breloer, to the courage of Alexander who chose the time and place of crossing the Jhelam in such a manner as to confound Porus and make it possible for him to mistake the enemy for his friend (pp. 151-3). The preliminary encounter with the younger Porus, argues Breloer (p. 45), was just an accident, and not the result of his having been despatched by his father to stop the crossing of the river by the enemy. By this argument Breloer seeks to support Aristobulos' smaller figures for the troops under command of the younger Porus against the higher ones of Ptolemy. These discrepancies are reported only by Arrian (in a passage omitted from the extracts given above), and Curtius, like Arrian, is quite definite that Porus the elder sent his brother (not son as in Arrian) after learning of the enemy's crossing, meaning thereby to gain time for completing his dispositions after taking in the new situation as it was developing. And Breloer himself accedes elsewhere that this encounter with the younger Porus frustrated the plan Alexander had made of surprising Porus' camp with his cavalry force. (p. 157). But in postulating that Alexander had such a plan of surprise and that it was frustrated by an accidental encounter with one of the outposts of Porus, the talented German scholar abandons the guidance both of Arrian and of Curtius. Both Arrian and Curtius say clearly that after ascertaining that the army advancing in his direction and on his side of the river was not that of his friend Abhisares, but the enemy troops that had crossed the river, Porus

16. See plan Fig. III reproduced from Breloer.

sent his son (Arrian) or brother (Curtius) with some troops to obstruct the advance of the enemy and gain him time. Following Plutarch, Breloer locates this preliminary skirmish at about twenty stadia down the river from the place of crossing that is to say more or less opposite the point where the reserve forces under Meleager and others had been posted on the opposite bank. (p. 156). From this point it was a distance of twelve miles for the cavalry to Porus' camp, while the infantry had to cover two miles more. (p. 157). And, according to Breloer, Alexander marched the whole length, and offered battle to Porus in his own camp; the main attack thus came upon Porus not from the river front as he had been expecting, but from the rear, and Alexander, says Breloer, greatly admired the tactical ability with which Porus met this new and unexpected development. (p. 158). And according to the same writer the result of the battle can hardly be called a defeat for Porus; it certainly was not that in a political sense (p. 170) and even in its military aspect after recovering from the initial surprise due to the shock of Alexander's audacious crossing of the river followed by an attack in a most unexpected quarter, Porus put up a magnificent fight which lasted for the best part of the day and gave the Macedonian soldiers the taste of a good pounding such as they had not experienced ever before. (pp. 114-5). The superiority of the Greek cavalry both in numbers and in quality carried the day in the end.

In connection with his study of Porus' battle array Breloer discusses Indian tactics as unfolded in the pages of Kauṭilya, particularly Bk. X ch. 6 though it can hardly be said to give any direct support to Breloer's view of the manner in which Porus arrayed his troops. This is best seen on the plans reproduced here from Breloer's work. The elephants are seen there ranged nearly in a semi-circle continued on either wing by infantry, and cavalry with the chariots ranged before the horse. Alexander attacked the infantry on the left wing (p. 84) and broke through the line between the main lines of elephants and infantry on the one side and the cavalry and chariots on the other, and Koinos did the same on the right wing of Porus. When these operations had been put through successfully and a general cavalry engagement developed behind Porus' main line, the Macedonian phalanx attacked the centre and narrowed the field within which the Indian troops could operate. Breloer, it may be noted in passing, makes an interesting comparison of the role of the elephants in Porus' troops with that of the tanks in modern warfare. (p. 74).

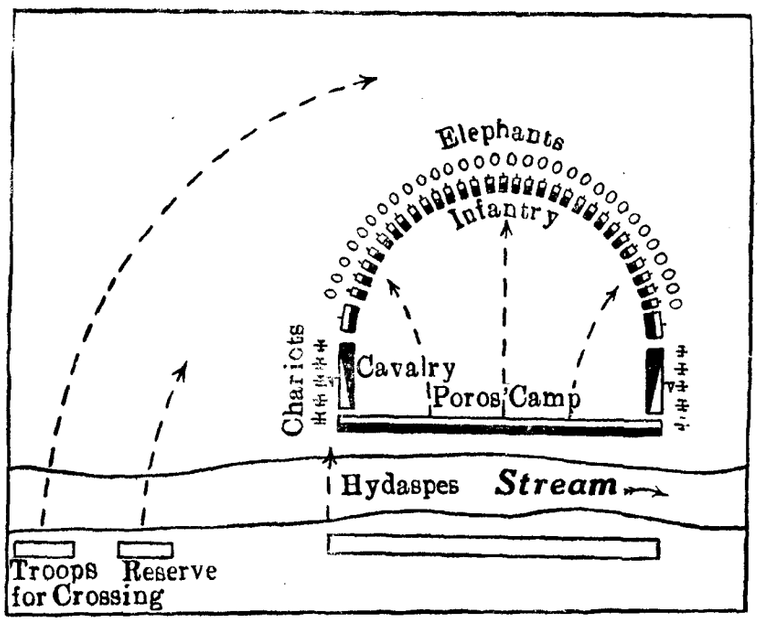


Fig. III Porus' battle array.

(After Breloer).

These suggestions and interpretations of Breloer are not by any means improbable. None of our authorities is, strictly speaking, contemporary; we have contemporary sources dealt out to us at second hand by later writers. Till recently Arrian carried the palm for clarity and accuracy, and historians leaned strongly on him, little hesitating to reject the other writers where they contradicted him. Breloer places, however, more reliance on Curtius and Plutarch and another anonymous Latin source, and these do give more support to his line of thought. I have indicated already the weak links in the chain of Breloer's argument. The elucidation of the role of Koinos still remains unconvincing on any account; and the bold manner in which the march of Porus from his camp to the battle field is cut out altogether seems too drastic a simplification in the face of Arrian's categorical statement that after some hesitation Porus 'at last decided to march with all his forces against Alexander', and that he spent some time finding a place suitable for the movements of his cavalry before he drew up his army in

order of battle. But the array of Porus as portrayed by Breloer is much more satisfactory than Smith's impossible plan of the battle.

The chief gains, as I estimate them, from the penetrating study of Breloer are then two: first, he has given a closer consistency to Abbot's theory of the crossing at Jhelam, and reconciled it better with the texts of our sources, and more exactly and convincingly located the place of crossing than Smith was able to do; secondly, his elucidation of the battle array of Porus is a distinct advance on anything that was forthcoming previously.

SOME ASPECTS OF THE INDIAN EXPORT TRADE: 1900—1938

By

N. Sundara Rama Sastry and K. C. Cheriyan

A detailed study of the export trade of any country necessarily involves a study of the volume and value of each constituent item of trade as well as the total, and also the direction of trade of each item and the total. India being mainly an agricultural country, fluctuations in the value of her exports bring about changes in the purchasing power of the agriculturist, though not to the same extent. But a variation in volume of exports means a variation in the available supply of raw materials which may seriously affect their prices.[1] In this paper we restrict ourselves to a statistical analysis of the available data relating to the Sea-borne Trade of India during the period 1900-1938, with a view to study the fluctuations in the volume of the chief items of exports, and then compute suitable index numbers for the total volume of export trade.

It can be seen that it will not be possible to include all items of export trade, since, owing to difficulties in enumerating different items of varying units, only figures of value are available for a good number of them. Moreover, the total number of items is too large for a detailed analysis. Hence the chief items which form the main part of the trade are taken in the following three groups and the analysis is confined to these groups.

(1) Articles of food and drink; (2) Raw materials; (3) Manufactured articles.

The data* comprise figures of quantity and value of about sixteen commodities, and they constitute about three-fourths of the total export trade for each year. The following is a list of the commodities chosen.

*Collected from the 'Annual Statements of the Sea-borne Trade of British India with the British Empire and Foreign Countries' for the years 1900-01 to 1937-38, published by the Director-General of Commercial Intelligence and Statistics with the Government of India.

GROUP I.

(1) Tea; (2) Tobacco (including both manufactured and unmanufactured) (3) Total of Grain, Pulse and Flour.

GROUP II.

(1) Gums and Resins; (2) Lac; (3) Oilseeds (being the total of all non-essential oilseeds); (4) Raw Hides and Skins; (5) Raw Cotton; (6) Raw Jute; (7) Raw Wool; (8) Ores.

GROUP III.

(1) Cotton Piecegoods; (2) Jute Cloth; (3) Jute Bags; (4) Metals and manufactures thereof (5) Hides and Skins, (tanned or dressed).

It will be seen from this list that as many commodities as possible have been included, since the greatest possible completeness is desirable in the study.

2. Index relatives were first calculated, for the quantity of the exports, for each commodity separately by taking the required data. The base chosen is the average of the five pre-war years 1909-10 to 1913-14. The advantages of choosing this period as base are clear. As there was a uniform and simultaneous growth of trade in all the commodities during this period, trade fluctuations were at a minimum. Hence the index numbers of the several commodities based on this period are comparable with one another.

A common characteristic of these numbers (see Table I Appendix) is a steady but slow increase till 1913-14, followed by a period of setback during the war; a marked rise during the post-war boom, and finally fluctuations and slow decline in the early 'thirties. Because of this change after the war of 1914–18, it was found that for a study of the trend of trade, it would be advisable to split up the whole period into two parts: the first one from 1900-01 to 1918-19, and the second from 1919-20 to 1937-38, each of nineteen years duration.

To eliminate secular trend in economic time-series, different methods are advocated by different writers, but they all depend on one of two processes. Either (1) a polynomial of chosen degree is fitted to the whole series, almost invariably by least squares, or (2) a moving average of chosen length with chosen weights is used to determine trend values at different parts of the series.'[2] The

former method has the disadvantage that the calculations have to be done all over again whenever some more years are added to the series. But if the latter method is used, it almost invariably introduces spurious oscillations in the residual fluctuations. In this problem, since residual fluctuations are used to calculate the changes of volume, it is not desirable to use this latter method. Hence to eliminate trend, ordinary second degree regression curves were fitted, by the method of Orthogonal Polynomials,[3] to the quantity index numbers of the commodities for each of the two periods. Generally these curves were found to provide good fit, but in the case of metals, due to the steep growth in the post-war period, a second degree logarithmic curve had to be fitted. Fluctuations about the trend curves were then found by dividing, for each year, the actual value by the corresponding polynomial value. Trend curves were also fitted for the whole period, 1900-1938 to study the long-term movements of the commodities. This latter work is particularly easy, since the first, second and third sums for the complete series are obtainable from the corresponding sums for the two half periods by the following relations.

$$s_1 = s_1' + s_1''$$

$$s_2 = s_2' + s_2'' + s_1' n'$$

$$s_3 = s_3' + s_3'' + n' s_2' + \frac{n'(n'+1)s_1'}{2}$$

Where s_1, s_2, s_3 are the sums of the successive columns in the complete series, s_1', s_2', s_3' the sums for the pre-war period, and s_1'', s_2'', s_3'' the sums for the post-war period, and $n' = 19$ years.

3. The equations of the trend curves for volume of trade are given below.

A. Short-Term Trends.

Group I.

(1) *Tea*

1900–1919 $y = 88{\cdot}9384 + 4{\cdot}9597\ t + 0{\cdot}2003\ t^2$
1919–1938 $y = 126{\cdot}1421 + 0{\cdot}0414\ t - 0{\cdot}1648\ t^2$

(2) *Tobacco* (total)

1900–1919 $y = 86{\cdot}6233 + 4{\cdot}2481\ t + 0{\cdot}0901\ t^2$
1919–1938 $y = 131{\cdot}5521 + 1{\cdot}1630\ t + 0{\cdot}2023\ t^2$

(3) *Total of Grain, Pulse and Wheat.*

1900–1919 $y = 77 \cdot 5529 + 1 \cdot 0642\ t - 0 \cdot 0258\ t^2$
1919–1938 $y = 52 \cdot 5135 - 0 \cdot 8156\ t - 0 \cdot 0501\ t^2$

Group II.

(1) *Gums and Resins.*

1900–1919 $y = 92 \cdot 4876 - 2 \cdot 2840\ t - 0 \cdot 1552\ t^2$
1919–1938 $y = 148 \cdot 4411 + 7 \cdot 1539\ t - 0 \cdot 2633\ t^2$

(2) *Lac*

1900–1919 $y = 91 \cdot 4837 + 2 \cdot 3163\ t - 0 \cdot 4763\ t^2$
1919–1938 $y = 131 \cdot 5239 + 3 \cdot 5065\ t - 0 \cdot 1922\ t^2$

(3) *Hides and Skins (Raw).*

1900–1919 $y = 91 \cdot 6342 + 0 \cdot 2968\ t - 0 \cdot 3250\ t^2$
1919–1938 $y = 64 \cdot 3231 - 1 \cdot 2430\ t - 0 \cdot 1527\ t^2$

(4) *Raw Jute*

1900–1919 $y = 101 \cdot 4084 - 1 \cdot 6686\ t - 0 \cdot 4887\ t^2$
1919–1938 $y = 93 \cdot 6580 + 1 \cdot 5842\ t - 0 \cdot 1486\ t^2$

(5) *Raw Cotton*

1900–1919 $y = 100 \cdot 2508 + 1 \cdot 5314\ t - 0 \cdot 4945\ t^2$
1919–1938 $y = 141 \cdot 9038 + 0 \cdot 8595\ t - 0 \cdot 2996\ t^2$

(6) *Raw Wool*

1900–1919 $y = 101 \cdot 2298 + 2 \cdot 8572\ t - 0 \cdot 7038\ t^2$
1919–1938 $y = 76 \cdot 9217 + 0 \cdot 7477\ t + 0 \cdot 0484\ t^2$

(7) *Ores*

1900–1919 $y = 87 \cdot 2453 + 4 \cdot 1051\ t - 0 \cdot 5773\ t^2$
1919–1938 $y = 165 \cdot 5522 + 0 \cdot 1758\ t - 2 \cdot 0156\ t^2$

(8) *Oilseeds, (total of all non-essential oilseeds)*

1900–1919 $y = 90 \cdot 1152 - 0 \cdot 9191\ t - 0 \cdot 5784\ t^2$
1919–1938 $y = 79 \cdot 0113 - 0 \cdot 0309\ t - 0 \cdot 2902\ t^2$

Group III.

(1) *Jute (Gunny Cloth)*

1900–1919 $y = 144 \cdot 6198 + 4 \cdot 9214\ t - 1 \cdot 9361\ t^2$
1919–1938 $y = 192 \cdot 9494 + 0 \cdot 1337\ t - 1 \cdot 8134\ t^2$

(2) *Jute (Gunny Bags)*

1900–1919 $y = 93 \cdot 0901 + 8 \cdot 3711\ t + 0 \cdot 5684\ t^2$
1919–1938 $y = 117 \cdot 5513 + 2 \cdot 6984\ t + 0 \cdot 2318\ t^2$

(3) *Cotton, (Piecegoods only)*

1900–1919 $y = 91 \cdot 0974 + 6 \cdot 2065\ t + 0 \cdot 7157\ t^2$
1919–1938 $y = 139 \cdot 7198 - 5 \cdot 0548\ t + 0 \cdot 4339\ t^2$

(4) *Metals.*

1900–1919 $y = 60 \cdot 9726 + 9 \cdot 1133\ t - 0 \cdot 0650\ t^2$
1919–1938 $\log y = 2 \cdot 8324 + 0 \cdot 0538 - 0 \cdot 0063$

(5) *Hides and Skins tanned or dressed*

1900–1919 $y = 111 \cdot 7652 + 2 \cdot 5505\ t + 0 \cdot 5666\ t^2$
1919–1938 $y = 115 \cdot 0308 + 1 \cdot 8512\ t + 0 \cdot 0802\ t^2$

B. Long-Term Trends

Group I.

(1) *Tea.*

$y = 121 \cdot 1581 + 1 \cdot 6455\ t - 0 \cdot 0874\ t^2$

(2) *Tobacco.*

$y = 121 \cdot 5425 + 2 \cdot 5827\ t - 0 \cdot 0671\ t^2$

(3) *Grains.*

$y = 65 \cdot 9917 - 0 \cdot 9868\ t - 0 \cdot 0699\ t^2$

Group II.

(1) *Gums and Resins.*

$y = 87 \cdot 6236 + 2 \cdot 6397\ t + 0 \cdot 2209\ t^2$

(2) *Lac.*

$y = 100 \cdot 4301 + 2 \cdot 6446 . t + 0 \cdot 0087\ t^2$

(3) *Hides and Skins*

$y = 166 \cdot 2102 - 1 \cdot 0006\ t - 1 \cdot 0359\ t^2$

(4) *Oilseeds.*

$y = 72 \cdot 1355 - 0 \cdot 2156\ t - 0 \cdot 0050\ t^2$

(5) *Raw Cotton*

$y = 114 \cdot 6201 + 2 \cdot 1350\ t - 0 \cdot 0412\ t^2$

(6) *Raw Jute.*

$y = 80 \cdot 6865 + 0 \cdot 0864\ t + 0 \cdot 0606\ t^2$

(7) *Raw Wool*

$y = 87 \cdot 9508 + 0 \cdot 3809\ t - 0 \cdot 0724\ t^2$

(8) *Ores.*

$y = 99 \cdot 8549 + 1 \cdot 9228\ t - 0 \cdot 1027\ t^2$

Group III.

(1) *Jute (Gunny Cloth)*

$y = 127 \cdot 2126 + 2 \cdot 6853 . t - 0 \cdot 1220\ t^2$

(2) *Jute (Gunny Bags)*

$y = 131 \cdot 1885 + 1 \cdot 9482\ t - 0 \cdot 1153\ t^2$

(3) *Cotton.Piecegoods.*

$y = 161 \cdot 8132 + 1 \cdot 7304\ t - 0 \cdot 2425\ t^2$

(4) *Metals.*

$y = 304 \cdot 1836 + 41 \cdot 0405\ t + 1 \cdot 3010\ t^2$

(5) *Hides, and Skin.*

$y = 112 \cdot 7633 + 0 \cdot 8917\ t + 0 \cdot 0028\ t^2$

4. From a study of the graphs and the equations of the trend curves given above, we arrive at the following conclusions.

During the period 1900–1919 in Tea, Tobacco, Lac, Raw Cotton, Raw Wool, Ores and Jute Cloth, we observe a rapid and unhampered growth in exports from the beginning of the century. In Metals, the trend curve is almost linear indicating uniform growth. In Cotton Piecegoods and Jute Bags, rapid increase in exports occurred only towards the end of the period, indicating the great amount of encouragement given to these commodities during the War. The former commodity started with a depression which extended till 1905. In Grain, Pulse and Wheat, the initial growth was slight and was soon brought down by the year 1911–12. The trend curves for Oilseeds, Raw Jute and Raw Hides and Skins, are characterised by a rapid expansion in exports for a few years from 1900, followed by a decline at the same rate. In Gums and Resins and tanned Hides and Skins, the position was much worse. Exports decreased from 1900, and the decrease was heavier in the latter commodity.

In the post-War period, the graphs of indices of quantity of almost all commodities are characterised by two main depressions, the first one occurring in the early 'twenties, and the second one by about 1930. The only exceptions are Oilseeds in which depression started earlier (1917 to 1920) and Cotton Piecegoods which after a return to the normal from a post-War boom was very little affected. The first depression following the post-War boom of 1919–20, was heaviest in Grains (1919–20) and tanned Hides and Skins (1920–21). In Raw Cotton (1918–19), Raw Wool (1920–21,), Ores (1919–20), Jute Bags (1921–22) and Metals (1918–19), the effect was only moderate. The order in which the commodities were affected by the general depression of 1930 are as follows: Cotton Piecegoods, Ores, Raw Cotton, Tobacco, Metals, Jute Cloth, Gums and Resins, Lac, and tanned Hides and Skins. In Oilseeds, Raw Jute, Raw Wool and Jute Bags the effect was very slight. In Grains and Raw Hides and Skins it is scarcely perceptible as there was very little growth of trade in these commodities after the War. In Tea it was almost negligible.

As regards the trend curves for this period, we note that Metals mark the maximum expansion in exports. Next in order of growth of exports come Gums and Resins and Lac. In Tea and Jute Cloth, the position attained just after the War was maintained throughout. In Grains, Oilseeds and Raw Cotton, the slight growth following the post-War boom was rapidly diminished. In Raw Wool exports remained almost stationary. Raw Jute indicates only slow growth. Decreasing tendencies are also evident in Tobacco, Raw Hides and Skins, Cotton Piecegoods, Jute Bags and Ores. This tendency is maximum in Cotton Piecegoods.

The general trend for the whole period (1900-1938) shows that after Metals which show the maximum expansion in exports, the following commodities (arranged in descending order) also exhibit increasing tendencies: Tea, Tobacco, Lac, Raw Cotton, Ores, Jute Cloth, Jute Bags, and tanned Hides and Skins (slight growth only). In Raw Wool and Cotton Piecegoods, depressions occurred at the extremes with a maxima at the centre. Raw Hides and Skins show a slow decreasing tendency from 1910. In Gums and Resins and Raw Jute, we have curves with a single minimum in the centre. A uniform decrease in exports is noticeable only for Oilseeds and Grains.

The equations of trend curves are useful in exhibiting the average exports of the commodities and their rates of increase or

decrease during the given period. For articles of Food and Drink, we observe that the average exports for all the three commodities is below the base level during the first period, but in the case of Tea and Tobacco, it is above the base level for the second period and also for the whole period. Among Raw materials, only Textiles show an average export exceeding the base level. During the period 1900-1919, in the second period, Gums and Resins, Lac, Cotton, and Ores have average values above the base level. But for the whole period, only Lac, Hides and Skins and Raw Cotton manitain an average exceeding the base level. In the third group, for the whole period, all the commodities show an average volume of export above the base level, the average in Metals being about three times the base level. As can be seen from the equations for the half periods this is due to increased export in the post-War period. During the period 1900-1919, the averages of all commodities except tanned Hides and Skins remained below the base level.

4. *Index Numbers of Total Volume.*—Like the Price Index, a Quantity Index Number, to study the quantum of export or import trade, can be constructed in a variety of ways using different systems of weighting. But special problems always necessitate the formulation of particular methods of construction, depending largely on the available data and also to a certain extent on facilities in computational work. Our purpose in constructing an index of volume is to study the total movements of the exported commodities. Hence the index number that we construct should be a thoroughly representative one. Its fluctuations should be representative of the fluctuations of the individual commodities, while these commodities themselves should form a representative sample of the total number of commodities. In dealing with the volumes of the individual commodities, the first step should be to reduce them all to the same unit. Then we combine them into a representative index by a system of weighting calculated to give importance to those commodities which predominate. The first two methods followed in this paper are in effect based on this principle. Values of the commodities are used as weights since the value of a commodity is the only medium in which the relative importance of that commodity can be measured.[4] Three separate indices are calculated below. The fourth one calculated by Mathew and Sastry,[5] is also included for purposes of comparison. The methods employed in the calculations are indicated below.

Method 1.—The fluctuations about the trend curves of quantity, of each of the commodities in each group, were first weighted by the values of the commodities. These weighted fluctuations in each group were then combined into a single index by weighting them again by means of the total values in each group. As the grouping of commodities in the 'Annual Statements of the Sea-borne Trade' has not been very consistent from the beginning of this century, some adjustments and regrouping had to be done, especially for the earlier years, to obtain the total values for each group. The group indices as well as the combined index number are given in table II, Appendix.

Method II.—In this method, we combine all the index numbers of quantity, of the commodities, by weighting them by means of the values of the commodities. Trend for the whole period was found to be represented by the equation.

$$y=109\cdot1052+2\cdot1876\ t+0\cdot0032\ t^2$$

The indices eliminated for trend give the required index numbers.

Method III.—Since the total tonnage of cargoes cleared, at all ports of the country, is an indicator of the total volume of export, these figures were collected and index numbers formed by taking simple relatives with the same five-year period as base. A second degree curve was fitted and trend eliminated. The equation to the curve is given below.

$$y=\ 91\cdot2455+1\cdot0892\ t-0\cdot0060\ t^2$$

Method IV.—In this method, the total value of trade for each year is divided by the index number of wholesale prices for that year. As before, trend is eliminated from them and the fluctuations about trend give the required index numbers.

Group Fluctuations.—Among the weighted group indices, articles of Food and Drink show four prominent maxima at 1904-05, 1912-13, 1917-18, and 1924-25, the first one being the highest. These are alternated by periods of minimum export occurring in 1908-09, 1914-15, and 1920-21. The tendency towards periodicity seems to have been effectively checked by about 1925, and the fluctuations appear steadier afterwards, though they lie below the normal till about 1934. The trade depression of 1930 has the least effect on this set of commodities, but the set-back in export due to the War of 1914-18 is clearly noticeable.

In the second group, fluctuations *about* trend become prominent only after 1913-14, though they are of smaller amplitudes than the fluctuations of group 1. In the later years, the effects of post-War boom and the subsequent depression in raw materials can be clearly distinguished. During the first year of War, exports droped to a low level, but they soon recovered. In the post-War period, we observe three well-marked depressions occurring in 1920-21, 1926-27 and 1932-33.

The fluctuations for manufactured articles are more or less similar to those of raw materials; but they are less intense. After 1920, we have two depressions alternated by years of heavy export. The second depression is of greater duration. The effect of the War seems to have produced a slight drop in exports in 1914-15, which is followed by rapid expansion later. This of course is mainly on account of Jute Bags and Cotton Piecegoods.

Aggregate and Tonnage Indices.—The trend curve for aggregate weighted index numbers shows uniform growth throughout, and an average export above the base level. The tonnage index trend also indicates uniform growth but at a lesser rate and an average export below the base period level. The effect of decreased shipping facilities during the War is clearly noticeable in this index, but the depressions in the post-War era are not very great.

5. In order to determine which of the four indices give the best estimate of fluctuations of the total volume of trade, the method given by Dr. Rhodes is used.[6]

The following results were obtained by applying the above method to the four sets of Index Numbers of total volume. (It has to be noted that only thirty-six values were taken in each case as in the last index we have values only up to 1936.)

$\Sigma xy = 2409 \cdot 72$ $\quad \Sigma yz = 3229 \cdot 18$
$\Sigma xy = 1791 \cdot 10$ $\quad \Sigma yu = 4527 \cdot 24$
$\Sigma xu = 3710 \cdot 07$ $\quad \Sigma zu = 5089 \cdot 97$

Taking logarithms and solving for Rx, Ry.....we have,

$Rx = 38 \cdot 86$	$RxRu = 3487$	$RyRz = 3038$
$Ry = 57 \cdot 63$	$RxRy = 2240$	$RyRu = 5172$
$Ry = 52 \cdot 70$	$RxRz = 2047$	$RzRu = 4730$
$Ru = 89 \cdot 74$		

Forming the normal equations for Px, Py etc., we get as a first approximation.

$Px = +1 \cdot 5749$	Therefore,	$R'x = 40 \cdot 4349$
$Py = -3 \cdot 9575$		$R'y = 53 \cdot 6725$
$Pz = +3 \cdot 7375$		$R'z = 56 \cdot 4375$
$Pu = -1 \cdot 3796$		$R'u = 38 \cdot 3604$

The process was repeated and the following values were obtained.

$Px = -0 \cdot 2157$	and	$R'x = 40 \cdot 2192$
$Py = +0 \cdot 2211$		$R'y = 53 \cdot 8936$
$Pz = +0 \cdot 0134$		$R'z = 56 \cdot 4509$
$Pu = -0 \cdot 0691$		$R'u = 88 \cdot 2913$

Also we have,

$\Sigma(x_t^2) = 3166 \cdot 21$
$\Sigma(y_t^2) = 5388 \cdot 11$
$\Sigma(z_t^2) = 6421 \cdot 69$
$\Sigma(u_t^2) = 9806 \cdot 66.$

Therefore we get.

$\Sigma(a_t^2) = 1548 \cdot 6260$	$s(a) = 6 \cdot 5303$
$\Sigma(b_t^2) = 2483 \cdot 5899$	$s(b) = 8 \cdot 3013$
$\Sigma(c_t^2) = 3234 \cdot 9859$	$s(c) = 9 \cdot 4402$
$\Sigma(d_t^2) = 2011 \cdot 2181$	$s(d) = 7 \cdot 4341$

From this analysis it is clear that Method I gives the best estimate. Next best is the index number computed by Mathew and Sastry. The aggregate index and the Tonnage index do not provide good estimates of the required index.

As can be seen from the accompanying graphs, the index numbers formed by the first method show maxima and minima at the periods given below.

Max: ..	1904—05	1913—14	1916—17	1924—29	1936—37
Min: ..	1908—09	1914—15	1921—22	1932—33	

The amplitude of the first depression was rather slight, but those of the second and the fourth are rather higher and the last one is of greater duration than the others.

Summary and Conclusions.—An analysis of the volume of exports of most of the important commodities exported from India during the years 1900 to 1938 is made by forming index numbers of quantity for each commodity on a pre-War five-year average as base, and eliminating secular trend by fitting second degree curves. Indices of the total volume of trade are then constructed by three different methods. Dr. Rhodes' method, is employed to determine the relative precision of these as well as of another index constructed previously.

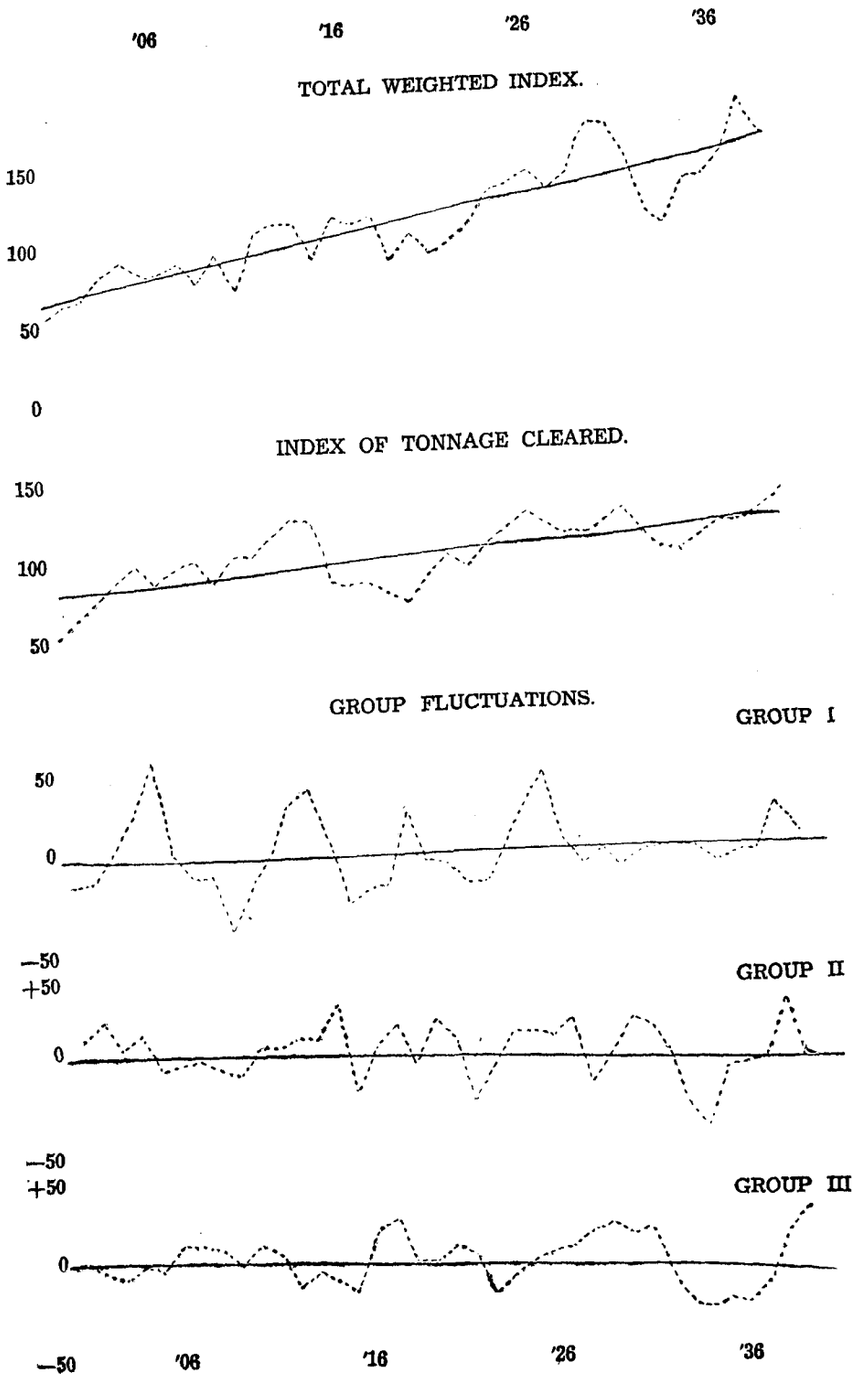
Some of the main conclusions arrived at by this study are as follows.

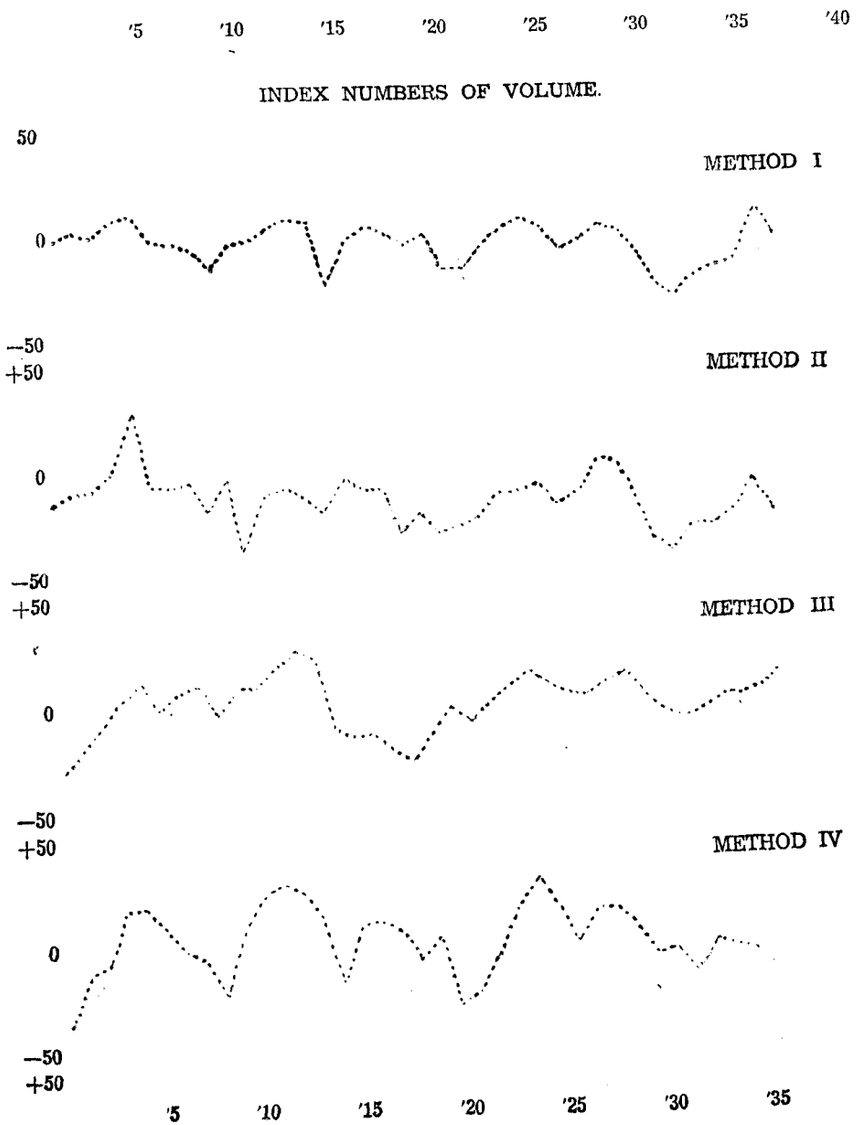
1. An increasing trend in exports is observed in all the commodities except Grains, Oilseeds and Raw Hides and Skins. In Raw Wool and Cotton Piecegoods this tendency is noticeble only towards the end of the period.

2. The maximum rate of increase, in the post-War period, is observed in Metals, followed by Gums and Resins and Lac.

3. The Average export for the whole period is maximum for manufactured articles.

4. A similarity in fluctuations is noticeable between raw materials and manufactured goods. The effect of the trade depression of 1930 is maximum for manufactured goods and minimum for articles of food and drink.





REFERENCES

1. 'Economic Problems of Modern India' Edited by R. K. Mukerjee Vol. I. p. 333.

2. M. G. Kendall.—'The effect of the elimination of trend on oscillations in Time—Series' J. S. S. Vol. 104. Part I. 1941. p. 43.

3. R. A. Fisher.—'Statistical Methods for research workers' 1938. p. 153.

4. E. C. Rhodes.—'A Quantity index number' J. S. S. 1933. p. 314.

5. N. T. Mathew and N. S. R. Sastry. 'Trends of Foreign Trade of India during the past sixty years'. Sankhya Vol. 4. part 4. p. 487.

6. E. C. Rhodes.—'The precision of index numbers' J. S. S. Vol. 99 1936. pp. 142-146.

7. Whittaker and Robinson.—'The calculus of observations' Chapter IX. Secs. 106-109. p. 209.

APPEN

TABLE I. INDICES OF

	Tea.	Total Tobacco.	Grain, Pulse and Wheat.	Gums and Resins.	Lac.	Oil seeds.	Raw Hides and Skins.
1900-01	71·4	29·4	37·2	95·4	52·3	37·9	95·5
-02	67·4	90·4	49·6	135·4	36·2	79·5	61·7
-03	68·1	70·6	71·7	95·1	55·0	77·0	59·3
-04	77·7	55·5	87·5	99·3	54·2	85·6	60·8
-05	79·4	59·9	115·7	76·5	55·3	93·2	69·9
1905-06	80·4	63·9	76·2	91·2	63·4	60·5	96·3
-07	87·7	99·9	66·6	90·5	61·9	68·2	101·0
-08	85·2	94·7	69·7	95·7	83·5	80·3	64·3
-09	87·7	53·4	39·3	77·9	87·7	56·2	80·4
-10	93·6	54·7	73·5	83·6	127·7	94·1	94·4
1910-11	95·4	86·4	89·1	109·1	97·1	107·1	91·0
-12	97·9	27·5	116·1	113·5	98·5	104·1	95·9
-13	104·5	97·1	125·0	85·0	98·6	85·0	114·6
-14	108·6	134·4	95·1	108·8	78·1	109·8	104·0
-15	112·8	83·6	58·3	67·4	84·4	66·1	72·9
1915-16	127·0	117·9	55·2	55·1	96·1	48·3	85·1
-17	109·3	132·5	66·1	75·6	87·8	64·9	95·0
-18	134·8	97·8	102·3	56·9	93·9	31·2	56·2
-19	121·5	147·6	73·6	56·8	55·0	38·5	57.2
-20	142·3	138·2	19·9	86·4	86·5	57·1	115·8
1920-21	107·2	110·5	33·7	65·8	71·1	43·1	59·2
-22	117·8	108·4	37·5	14·9	100·1	50·7	61·7
-23	108·2	103·1	58·9	126·8	109·6	81·3	58·1
-24	127·1	152·1	77·7	134·7	111·8	86·6	61·2
-25	127·6	197·5	96·6	83·4	98·3	91·8	58·4
1925-26	122·6	170·3	69·4	146·7	135·8	86·4	62·5
-27	131·1	133·3	55·1	117·8	136·3	57·9	61·8
-28	135·7	130·9	63·1	154·0	125·1	83·9	78·0
-29	134·9	151·7	52·1	171·4	171·2	92·3	78·2
-30	141·3	121·1	56·9	219·8	154·0	83·1	61·4
1930-31	133·7	130·2	59·3	147·9	126·0	72·1	53·4
-32	128·2	117·5	59·3	139·7	106·8	68·6	43·0
-33	142·2	96·8	46·6	142·9	96·3	50·7	34·6
-34	119·3	134·1	42·4	156·1	168·3	77·9	52·5
-35	121·9	122·5	40·0	156·2	134·9	60·4	49·0
1935-36	117·3	132·5	35·2	162·7	112·3	46·3	57·0
-37	113·3	131·1	42·6	247·9	192·0	80·0	55·9
-38	125·4	233·0	19·9	195·2	153·0	65·6	53·7

DIX

QUANTITY OF EXPORTS.

Cotton. Raw	Raw Jute.	Raw Wool.	Ores.	Cotton Piece Goods.	Jute Cloth.	Jute Bags.	Metals.	Hides & Skins (Tanned or dressed.)
41·6	81·2	40·1	21·3	76·9	37·7	59·8	10·49	146·6
66·3	96·5	35·9	21·8	80·5	43·2	67·1	4·13	83·1
70·3	85·3	51·2	25·4	77·1	50·8	66·4	3·81	80·2
92·3	89·8	54·9	29·6	84·0	56·9	60·9	6·01	82·5
65·8	82·9	70·7	30·0	96·9	59·3	59·4	7·24	81·9
86·1	94·7	77·9	52·2	101·9	67·9	68·8	5·69	106·4
86·1	104·5	84·1	81·1	85·0	71·8	76·0	11·10	115·6
99·6	92·5	72·9	90·9	82·2	81·4	86·4	17·12	88·4
79·1	116·9	79·5	72·2	86·4	79·4	88·E	14·21	97·9
104·3	95·5	109·6	82·5	104·3	96·9	107·4	36·03	96·9
101·0	83·3	106·8	94·0	110·6	98·5	106·4	46·01	91·7
85·2	106·0	96·0	88·2	90·3	89·8	85·5	62·30	102·9
85·8	114·6	97·9	116·7	95·9	105·3	91·9	191·20	113·5
123·6	100·5	89·6	118·6	98·9	109·4	108·7	104·30	95·1
120·4	66·1	81·7	73·4	74·5	109·0	117·2	109·80	104·4
103·0	78·5	119·1	78·1	125·8	122·9	234·2	142·80	124·6
103·6	70·6	89·5	106·1	292·4	126·9	237·4	221·80	152·8
85·0	36·4	78·1	74·2	210·0	123·4	223·6	107·90	124·6
42·8	52·1	86·8	72·3	165·2	113·7	146·1	33·70	177·4
99·6	77·4	66·5	64·9	217·9	131·5	101·1	95·30	180·2
86·2	61·8	42·2	134·6	162·2	139·5	133·8	138·90	42·0
124·2	61·2	59·1	89·6	178·4	115·5	96·9	167·10	64·3
139·7	75·6	96·7	140·7	174·0	129·3	101·5	301·00	91·1
156·3	86·3	67·1	129·5	183·2	139·1	103·6	429·30	113·0
138·1	91·1	96·7	111·8	201·2	150·1	106·5	753·80	121·0
173·4	84·6	79·5	102·8	182·7	150·7	106·5	842·30	115·1
132·6	92·6	82·1	95·3	218·8	155·0	132·4	797·10	114·7
111·6	107·3	93·0	124·2	186·9	160·0	136·5	1051·10	145·1
154·2	117·5	103·4	120·8	165·4	161·7	124·7	1192·20	146·6
169·1	105·5	92·3	147·5	147·9	170·2	130·9	1394·10	131·0
163·1	81·1	55·9	86·2	108·3	131·0	128·0	1115·40	110·6
98·6	76·7	75·6	38·3	116·0	105·3	114·6	1012·20	98·5
84·9	73·7	59·1	37·1	73·6	104·3	122·4	797·60	90·6
117·2	97·9	102·3	49·7	62·6	108·5	118·4	1143·70	123·0
145·0	98·4	62·4	84·1	63·9	109·6	124·7	1074·60	111·8
141·1	100·9	90·4	129·6	79·0	125·6	135·3	1310·20	126·7
177·3	107·4	95·2	122·2	112·6	176·1	167·3	1464·00	158·3
113·5	97·8	69·6	192·7	267·4	169·4	180·5	1232·50	147·7

TABLE II. INDICES

	Group Fluctuations.			Combined Index.	Total Weighted Index.
	Group I.	Group II.	Group III.		
1900-01	−11·16	+ 6·88	+ 0·98	+ 0·37	62·30
-02	− 9·13	+16·88	− 5·26	+ 4·29	68·34
-03	+ 6·26	+ 2·89	− 6·23	+ 2·51	70·65
-04	+24·30	+ 9·54	− 1·76	+10·96	82·55
-05	+50·24	− 7·67	− 2·34	+13·38	88·99
1905-06	+ 1·81	− 4·74	+ 9·07	+ 1·15	82·52
-07	− 7·75	− 3·33	+ 8·88	− 0·85	84·19
-08	− 7·63	− 6·41	+ 6·75	− 2·77	88·32
-09	−33·09	−10·84	− 0·65	−12·37	79·39
-10	−10·75	+ 3·21	+ 8·26	+ 0·81	92·85
1910-11	+ 2·27	+ 2·62	+ 3·68	+ 2·80	75·28
-12	+27·33	+ 7·21	−12·31	+ 9·14	103·38
-13	+34·41	+ 6·84	− 4·95	+13·31	107·72
-14	+ 9·27	+24·39	− 9·69	+12·61	106·90
-15	−22·13	−18·33	−15·17	−18·56	91·22
1915-16	−15·10	+ 3·92	+17·51	+ 3·10	110·46
-17	−14·68	+14·04	+21·74	+ 9·55	107·33
-18	+20·99	− 6·08	+ 0·36	+ 5·04	111·57
-19	− 2·18	+17·82	+ 0·30	+ 1·85	90·35
-20	−4·61	+ 7·31	+ 8·48	+ 6·00	103·44
1920-21	−15·33	−23·48	+ 3·20	−11·92	93·86
-22	−14·60	− 5·78	−15·48	−10·42	98·90
-23	+ 2·43	+10·17	− 6·05	+ 1·12	106·70
-24	+21·62	+10·60	+ 0·73	+11·37	123·51
-25	+38·23	+ 8·01	+ 5·58	+15·76	126·69
1925-26	+ 4·06	+16·82	+ 8·31	+11·95	134·13
-27	− 8·66	− 3·85	+16·23	+ 0·66	125·31
-28	− 0·95	+ 0·95	+19·91	+ 5·74	133·88
-29	− 9·65	+18·78	+15·32	+13·96	159·52
-30	− 3·39	+15·59	+16·84	+11·48	159·46
1930-31	− 1·50	+ 2·72	− 3·98	− 0·21	142·39
-32	− 0·43	−22·23	−17·04	−14·55	116·37
-33	− 2·18	−34·25	−21·38	−21·20	108·41
-34	− 8·82	− 4·94	−16·21	− 8·99	130·89
-35	− 4·52	− 0·07	−17·63	− 5·84	132·38
1935-36	− 3·63	+ 1·10	− 7·43	− 2·26	144·36
-37	+19·52	+28·30	+19·02	+24·65	170·51
-38	+ 8·36	+ 1·98	+30·02	+12·11	150·59

OF VOLUME.

Trend.	Fluctuations about trend.	Tonnage cleared index.	Trend.	Fluctuations about trend.	Method IV.
67·89	− 8·23	50·79	70·46	−27·92	−35
69·96	− 2·32	59·40	71·77	−17·24	−11
72·03	− 1·92	68·98	73·06	− 5·58	− 6
76·18	+ 8·36	79·25	74·35	+ 6·59	+20
78·26	+37·71	86·84	75·62	+14·84	+21
80·35	+ 2·70	78·19	76·87	+ 1·72	+10
82·44	+ 2·12	85·61	78·12	+ 9·59	0
84·54	+ 4·47	89·06	79·35	+12·24	− 5
86·65	− 8·38	78·27	80·58	− 2·87	−22
88·77	+ 4·60	90·19	81·79	+10·27	+ 8
90·89	−17·17	91·92	82·98	+10·77	+25
93·01	+11·15	101·74	84·17	+20·87	+30
95·14	+13·32	108·93	85·34	+27·64	+27
97·28	+ 9·89	107·24	86·51	+23·96	+ 3
99·43	− 8·26	77·76	87·66	−11·29	−16
101·58	+ 8·74	75·67	88·79	−14·78	+ 9
103·74	+ 3·46	76·54	89·92	−14·18	+11
105·90	+ 5·35	71·44	91·03	−21·52	+6·6
108·07	−16·46	66·82	92·14	−27·48	− 7
110·25	− 6·60	80·10	93·23	−14·08	−13
112·44	−16·52	91·57	94·30	− 2·90	−31
114·63	−13·72	85·16	95·37	−10·71	−25
116·82	− 8·60	96·74	96·42	+ 0·32	− 6
119·02	+ 3·77	104·04	97·47	+ 6·74	+16
121·23	+ 4·50	111·63	98·50	+13·33	+30
123·45	+ 8·65	106·32	99·51	+ 6·84	+17
125·67	− 0·29	102·53	100·52	+ 2·00	0
127·89	+ 4·68	102·99	101·51	+ 1·46	+14
130·13	+22·59	109·93	102·50	+ 7·21	+15
132·37	+20·47	115·11	103·47	+11·25	+ 6
134·61	+ 5·78	102·79	104·42	− 1·56	− 8
136·86	−14·97	95·21	105·37	− 9·64	− 6
139·12	−22·07	94·65	106·30	−10·96	−17
141·39	− 7·43	100·29	107·23	− 6·94	− 3
143·66	− 7·85	106·91	108·14	− 1·14	− 5
145·94	− 1·08	107·19	109·03	− 1·69	− 7
148·22	+15·04	113·49	109·92	+ 3·25	—
150·51	+ 0·05	123·47	110·79	+11·45	—

IRRIGATION IN INDIA

By

George Kuriyan

In any account of irrigation in India, some reference, however brief it may be, must be made to the climatic factors which render such irrigation necessary. It is a well-known fact that India presents a wider variety in meteorological conditions than any other area of similar size. Such enormous contrasts as exist between the temperature figures for stations like Dras (in Kashmir) and Jacobabad (in Sind), or the rainfall statistics of the latter and Chirrapunji (in Assam), are almost unparalleled. Perhaps the most salient feature of uniformity in the climate, is the prevalence of the monsoon.

Rainfall.—An important characteristic of the rainfall of India is its unequal distribution throughout the seasons. By far the greater part of the rainfall (approximately 80 to 85%) is brought by the summer monsoon; and over a large section of Western India including the whole of the Bombay Presidency, it is only during this season that there is any rain of importance. Again, this is the chief season of rain in Assam, Bengal, Central India, Rajaputana, the United Provinces, the major part of the Punjab, Central Provinces, Hyderabad, Deccan, Berar, Gujarat and the whole of the West Coast of the Peninsula. The South East of the Peninsula including the Carnatic plains and the Eastern Ghats receive only an occasional shower during the season of the South West monsoon, having their heaviest falls from September to December. In winter, the rainfall is generally scanty throughout India, although it is perceptible in the Punjab.[1] In rare circumstances, the winter rain is felt in the Gangetic plains and under exceptional cases, it extends to Bengal and the northern parts of the Peninsula. Lower Bengal and Assam have some thunderstorms in spring which become more frequent as the season advances.[2] In South India also, these are experienced and they are locally known as "mango showers," resulting in a total fall of 3 to 4 inches, chiefly in the months of April and May. Consequently it is true to say that there is no period of the year in which rain does not fall in some part or other, in India.[3] Nevertheless, the marked seasonal distribution of rainfall is such, that over the greater part of India, there is only one season of rainfall (viz: the period of the South West monsoon) followed by a period of several months when evaporation is generally high. From the point of view of irrigation therefore, it should be noted that if reservoirs of water are constructed, they should be such that they are able to store up water from the rains of one season till the next period of rains, which in the greater part of India is in the following year. The chances of subsequent rains filling up these reservoirs after their waters have been partially utilised, are few.

1. where it is economically important for the cultivation of wheat.
2. The May rainfall of Assam is not far short of that of June.

The average heaviness of precipitation per rainy day varies in the several parts of India; it is in excess of 1″ in Assam and Kerala, 0·6 to 0·7″ in Bengal, Central Provinces and Central India and between 0·3 to 0·4″ in Southern Deccan and the Mysore plateau. The corresponding figure for Great Britain is 0·1″, almost the same as for Leh in Tibet. The oft-quoted statement "it pours, it never rains in India" is as true of Jacobabad with a total of 4″ of rain falling in 14 days, or Galle (in Ceylon) with a total of 80″ of rain in 205 days, or Chirrapunji with 425″ in 125 days.[4] The Indian rainfall is therefore less penetrating. The surface flow is much greater,[5] filling up the dry beds of courses with temporary torrents, floods and destruction and also resulting in a considerable soil erosion.

Further, there is a remarkable variability of the monsoon rainfall in time and space in any one year. The variations in the amount of precipitation received from year to year are also surprisingly great. The average annual rainfall of India is about 42″ and the variations from this mean may be as high as+12″ as in 1917, or as low as—11″ as in 1899. The droughts occur particularly in the interior districts, the percentage variability of the annual rain-

3. Indian Meteorological Memoirs Vol. 3 Page 16.
4. A comparison of charts showing frequency of rainfall of more than 3 inches in 24 hours, with the annual rainfall map, shows that places with a high rainfall have occurrences of heavy rain more frequently than elsewhere.
5. Indian Irrigation Commission Report (1901—1903) Part I Page 14 where it is estimated that 40 per cent. of the total fall results in surface flow. See also Proceedings of the Institution of Civil Engineers Vol. 113 Page 319 where Perram estimates it at 37 per cent.

fall being 100% or even more in the dry tracts of N. W. India and the Deccan. As a rule, it is true to say that the variations from year to year are considerably and relatively greater where the fall is small, than where it is heavier.[6] The following four important variations are significant:—(i) the beginning of the rains may be delayed considerably over the whole, or a large part of India; or, (ii) there may be prolonged break or breaks lasting over the greater part of July or August; or, (iii) the rains may end considerably earlier than usual; or, (iv) they may persist in one part of the country, consistently shunning another.[7] Although the last constitutes the most common abnormality, it is the consequences of a premature ceasing of the rains that have been disastrous to the extreme, in the so-called famine areas of India.

The effect of these variations in producing famine differs considerably according to the average rainfall of the tract, being least in those parts where the average is either very high, or very low. It is obvious that where the rainfall is high, a large deficiency can be experienced without agriculture being affected detrimentally. Equally well, where the average rainfall is very low, say 10″ or less, cultivation would rely almost entirely on irrigation and hence would be almost independent of the vagaries of rainfall.[8] Hence Sind at one end and Bengal at the other end of the Indo-Gangetic lowland are both immune from famine, one due to aridity and the other to an abundance of rain. But between these extremes rendered safe, either by an assured supply of rainfall, or by exclusive reliance upon irrigation, lies a very large part of India, nearly a million square miles in area, where the average rainfall is between 10″ and 50″, no portion of which can be deemed to be absolutely secure against the uncertainties of the season and the scourge of famine.[9] There are degrees of precariousness within the whole tract. In general it may be said that a deficiency of 25% below the normal rainfall may cause some injury while a deficiency of 40% would cause serious scarcity. It is true that in a tract where

6. Indian Meteorological Memoirs Vol. 3. Pages 15 and 255. The variability is greatest in the driest part of the country in Sind (37 per cent.) and least in Assam (5 per cent.) and the remaining parts of India have a variability intermediate between the two.

7. Sunder Lal Hora, Field Sciences of India, Page 6.

8. In such tracts, normally pastoral activities will be important and the withering of the natural grasses may lead to distress, but famine from failure of crops need not be apprehended.

9. Indian Irrigation Commission Report 1901—1903, Part 1 Page 3.

the normal rainfall is 45″, a deficiency of 40% would still leave 27″, while the same deficiency on a rainfall of 25″ would leave only 15″; but in the former case, rice which needs great quantities of water would almost invariably be the prevailing crop, while in the latter, it would be cotton or millet, for which the quantity of water required would be very much less.[10] The quality of the soil, the classes of crops cultivated, the character and resources of the people, are all factors which greatly modify the effects of a deficiency of rainfall.

"Areas liable to severe famine may be defined as those in which the average rainfall is under 50″ and the mean annual deviation in excess or defect of that average, 12% and upwards."[11] Freedom from famine is thus greatest in Assam, Bengal and the Malabar Coast and the tracts most susceptible to famine are the Carnatic, the Punjab and the Upper United Provinces.[12] But tracts in which the suffering from famine has at times been most intense, are not necessarily those in which the rainfall is most liable to periodical defect. On the contrary, the effect of drought when it comes, is most felt in tracts like Gujarat, Malwa and a part of the Central Provinces, which owing to the adequacy of rainfall over a long period of years have come to be regarded as immune and where the protection of the country by irrigation has in consequence been neglected.

The general conditions of rainfall in India may therefore be summed up as follows:—The distribution is both seasonal and irregular and it is so heavy that the surface run-off is very great. Coupled with high sunshine records and powerful evaporation, the need for irrigation becomes obvious. Thus in much the larger part of the Indo-Gangetic lowland embracing the most densely peopled part of India, natural moisture is sufficient to ensure the harvest, but such is the degree of uncertainty that in the absence of irrigation, agriculture is reduced to a mere gamble. The history of famine in India is illuminative of the losses sustained.[13]

It has been estimated that more than 100 billion cubic feet of water falls normally as rainfall in India (excluding Burma), of

10. Triennial Review of Irrigation, 1918 to 1921, Page 4.

11. Indian Meteorological Memoirs Vol. 3 Page 130.

12. where the mean annual rainfall is between 30 and 40 inches and a mean annual variation from the average, between 15 and 23 per cent.

13. A. V. Williamson. The Geographical Journal Vol. 65. 'Irrigation in the Indo-Gangetic Plain'. Page 143.

which about 40% results in surface flow; the remaining 60% is absorbed in sustaining plant life, in maintaining moisture in the soil, in replenishing the sub-soil water supply, or is lost by evaporation.[14] Probably the irrigation works in India utilise about 7 Billion Cubic feet of water—less than 20% of the surface flow—; the remaining 80% or more runs to waste into the sea. This is of course only an estimate based on probabilities; but what ever the figures may be, the volume of water used in irrigation is at best a small percentage of the rainfall. It is suggested that arrangements ought to be made to divert the surplus of one tract to supply the deficiencies of another. For instance, nearly 16% of the whole surface flow of India is directly lost every year in the Arabian Sea from the steep slopes of the Western Ghats. The Periyar scheme by a bold design taps the flow on the western side of the hills by means of a tunnel and diverts it on to the plains of Madura, but the opportunities for similar works are not numerous. In the Western Ghats, dams of great height would be necessary; the broken nature of the ground would necessitate expensive channels; cyclonic storms produce floods which demand heavy escapes; and the construction of reservoirs may involve the destruction of valuable village sites and the submergence of much fertile land. Because of these difficulties, it is only possible to utilise a small percentage of the water which now flows into the sea for maturing crops on the land. Leaving mere questions of distance and cost out of consideration, the general contour levels of the country will frequently offer an insuperable obstacle to transfer the water from regions of copious and assured rainfall to those where it is scanty and capricious. The Irrigation Commission after a careful enquiry has opined that even if every measure which might reasonably be contemplated for increasing the area of irrigation in the Ganges Valley is carried to completion, more than 85% of the surface drainage will still flow past Benares, carrying annually about 15 billion cubic feet of water,[15] and from the catchment of the Ganges and from the outer slopes of the Western Ghats, there will still be a loss of 23 billion cubic feet—a volume which falls but little short of half the total surface flow of India excluding Burma and Assam. This however does not indicate that the peak of irrigation has been attained. Expansion is certainly possible.

14. Some of this underground water is being utilised by wells for irrigation, but no accurate estimate of the total quantity so used, is available.

15. Indian Irrigation Commission Report *op. cit.* Page 19.

Soils.—Second only to rainfall is the role of soil. It is obvious that the nature of the soil will have a considerable influence on the actual quantity of water needed and the rate at which it should be supplied. The soil may be retentive that with a fair amount of rainfall, the moisture is normally sufficient for the requirement of the crops grown, or, it may be such that heavy demands are made on the water. Thus the facilities for irrigation and the methods to be adopted, would to a large extent be delimited by the nature of the soils and some mention must be made of the different soil types of India.

The alluvial formation covers the greater part of Northern India from the foot of the Himalayas to the northern slopes of the Vindhyas and extends in a narrow fringe round the coast line of the Peninsula, increasing in width along the deltas of the rivers. The Indo-Gangetic lowland may be regarded as a vast stretch of river alluvium of great, and indeed, of unknown depth. The material composing it represents the deposition of the rivers originating mainly in the Himalayas, and as these were uplifted in tertiary times, the soil is a comparatively young deposit and exceedingly porous. However, two kinds of alluvium are distinguishable, a coarse gravel which fringes the hills at the foot of the mountain girdle—the old alluvium, or the *bhangar*[16] and a much newer deposit of fine sand and some clay—the new alluvium or *khaddar*.[17] This clay, locally known as 'mota', is of great importance in the hydrography of the plain. Its presence or absence makes the sand more or less capable of storing water. It does not form one continuous layer but occurs in beds which lie at varying depths, forming as it were islands in a sea of sand.

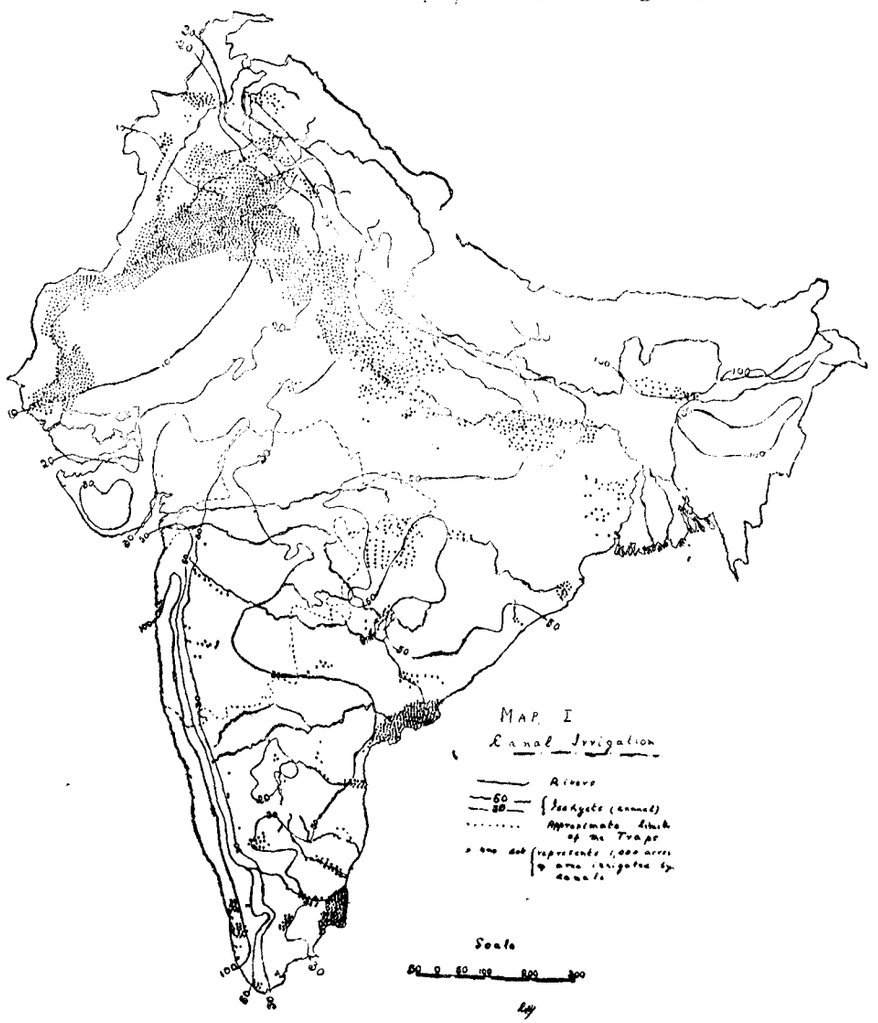
The surface shows every variety of soil from the blown sands of the western deserts to the rich loam and stiff clay of the Ganges valley, or the fertile black loam of the Kistna and the Godavari deltas. But the prevailing soil is a yellow or a red-brown loam, which in general takes water freely and yields a largely increased outturn under irrigation. The level surface prevents the rain from running off and consequently much of it percolates to the surface below. Rivers and canals assist by leakage or seepage [illegible] augment the underground water. Hence the saturation level [illegible] water table, is sufficiently near the surface to be easily tapped [illegible] the Indo-

16. containing fossiliferous remains of a pliocene age.

17. in which occur fossils chiefly of a living species.

Gangetic lowland is thus an ideal locality for irrigation[18]. Further more, through it flow the perennial streams fed by the glaciers or snows of some of the most lofty mountains in the world.

The Deccan trap formation covers an area of about 200,000 square miles in the northwestern part of Peninsular India, comprising almost the whole of the Bombay Presidency and Berar, the western third of the Central Provinces and nearly half of Hyderabad and Central India. (See Map I) Within the ranges of the Wes-



18. But the flatness of the surface which lends itself readily to the construction of canals is an obvious obstacle to the construction of reservoirs for the storage of water.

tern Ghats and Satpuras, numerous varieties of soils are to be found, varying from the light sandy or gravelly soils of the ridges, to the rich yellow or red loams of the inner valleys of the hills. Elsewhere in this wide tract, *Regur* or black cotton soil prevails. Regur soils when heated by the sun, contract to an unusual extent, seaming the surface of the country with deep cracks. Although they are mainly associated with the Traps, yet they are also found in Bellary, Cuddappah and Kurnool in Madras, Surat and Broach in Bombay, and Jalaun and Banda in the United Provinces. To these regur soils, generally irrigation is not suited owing to the greater depth of the subsoil and to its overlying an impervious substratum. Irrigation can only be applied where the soil is not of great depth and the substratum affords good drainage. The retentivity of regur, the low and uncertain rainfall of the areas it is primarily associated with, the fact that dry cultivation is traditional in these circumstances, all help to explain why irrigation is at a minimum in such tracts. Regur demands unusual care in the artificial application of water to it, and it is still a matter of controversy how far it can be guaranteed to respond successfully to irrigation.

The crystalline and sandstone formations may be said to extend over nearly the whole of the Madras Presidency, also over large portions of Bengal and Central Provinces and Hyderabad. The prevailing soils vary from a dark red loam in the lower ground to a light sandy soil in the uplands. They are least retentive and consequently demand irrigation. Without irrigation, these red loams cannot produce more than one crop a year; and further, under the erratic rainfall conditions of the Deccan plateau, irrigation must be available to supplement breaks in the rains when the red loams are quickly robbed of all their water by the hot sun.[19] Only in the river valleys as in the Wainganga are they used without irrigation. These red loams are typically irrigated lands and the better classes of them actually repay the cost of irrigation more abundantly than the yellow loam of the alluvial tract.

Each of these three great divisions of the soil, viz: the alluvium of the Indo-Gangetic lowland, the regur of the traps and the red loam of the peninsula has its own distinctive feature as regards irrigation. The level alluvial plains absorb the bulk of the rain that falls, and wells consequently give a good and assured supply.

19. Simkins. Agricultural geography of the Deccan plateau. Page 11.

Again, the great snow-fed rivers that traverse them with their gentle gradients, makes the task of distribution of their waters by canals, a fairly easy one. Consequently this is pre-eminently the region of wells and canals. The trap surface on the other hand is broken and uneven. Irrigation works except of the smallest kind are rare and it is confined to the more valuable crop. The crystalline tract is traversed by the large rivers which rise in the Western Ghats. Their channels are deep and their gradients small. Hence it is not easy to utilise their waters beyond the limits of their own narrow valleys; the uneven topography increases the difficulty of distribution of water. This undulating nature of the country however, gives facilities for the construction of numerous tanks and here, tanks become the dominant source of irrigation.

Some mention must now be made of what is often called "*the duty of water*". In its commonest form it is expressed as the number of acres which can be successfully watered by a flow of one cubic foot per second, an amount which is called a 'cusec'.[20] In the language of the Indian irrigation official, the duty of water may be defined as the area of the crop which can be matured by a given quantity of water. In popular parlance, it is considered to represent the amount actually used by skilled agriculturists and is somewhere between the minimum which will just keep the plant alive and the maximum which makes the ground so wet that the yield is reduced.

The duty of water varies primarily with the crop. Rice needs more water than indigo which in its turn makes greater demands than wheat. The duty varies even more largely with the soil. Sandy soil will take three times the water that clay soil will need. In the case of the sandy soil, the water is quickly absorbed by the soil, but it does not retain it and consequently it will pass beyond the reach of the crop roots and be lost. An ideal soil would be a layer of sand overlying a more retentive soil, as is found for example at Hagari in Bellary District. The duty of water varies according to the texture of the soil and the way in which it is kept. Soils in poor condition need more water than those in good tilth. The nature of the soil exercises a considerable influence on the root formations of the crop; lack of adequate drainage keeps a root system near the surface and consequently, it may so happen that

20. One cusec gives two acre feet approximately in 24 hours.

though the subsoil is saturated with moisture, irrigation becomes necessary.

The duty of water varies with the season, for obviously the need for irrigation water is greatest when the rainfall is scanty and vice versa. Even where irrigation is a necessity, the duty of water is greater if the air is damp, as the loss by evaporation and transpiration is then at a minimum. Evaporation is also checked by low temperature and the high duty obtained in the irrigation of wheat in upper India is partly due to the low temperatures prevailing when this crop is grown. The effect of wind in increasing evaporation may also be noticed.

It is said that the duty of water varies with the condition of the irrigation channels; flat shallow channels will often give smaller duties than steeper and deeper ones. It also varies with the distance the water has to be carried in the channels; the loss of irrigation water before it is delivered to the field occurs by seepage in the channel along which it travels and by evaporation from the surface. Empirical results have shown that these losses vary between 6% and 30%. These rather astonishing figures give some idea of the losses which may occur in the larger canals, many miles in length.

These factors, the soil, the climate and the crops grown affect the duty of water and largely determine the area which can be irrigated from a given source. Besides these, the skill of the user must be taken into consideration, since carelessness in the application of water to the crop may lead to considerable loss. It is found that the area which can be irrigated efficiently is increased by skilfully distributing the available supply and much therefore depends on the irrigation official also. As much water should be applied to the soil at each watering as the crop will tolerate without suffering. It is worth noting that experience has definitely fixed the optimum size of the plots in the Punjab under canal irrigation to be 110 feet by 55 feet.

History of Irrigation.—From very ancient times, irrigation has been practised in India. The Grand Anicut (probably constructed in the 2nd Century A.D.) is considered to be the greatest engineering work carried out in India before the British rule. It consisted of a solid mass of rough stones, over 1,000 feet in length, 40 to 60 feet in breadth and 15 to 18 feet in depth, stretching across the whole width of the Cauveri. Even before the improvements were

erected in the 19th Century, it irrigated over 600,000 acres.[21] Most of the existing inundation canals in the Multan, Muzaffargarh and Dera Ghazi Khan Districts were constructed by the former Muhammadan and Sikh rulers. The Western Jumna canal is attributed to Firoz Shah in the 14th Century; it was renovated by Akbar in 1568 and remodelled by the celebrated engineeer Ali Mardan Khan in 1628. Eastern Jumna Canal was started by Shah Jehan in the 17th Century. The Upper Bari Doab canal was built by the early rulers and water was brought to Lahore and to the sacred tank of Amritsar.[22] Again, most of the weirs in the Tungabhadra channels were constructed by the Hindu monarch Krishnaraya. The construction of anicuts and perennial channels in India was probably first instituted in Madras long before anything of the sort was attempted in any other part of India. It is therefore clear that India owes to her former rulers the first inception of her present unrivalled system of state irrigation works. The development of irrigation in India however has received a tremendous impetus during the last two hundred years—since the establishment of the British Raj—and most of the large irrigation systems in the country today, are post-British.

Mechanical methods of lifting water.—In a country like India, with a very long history of irrigation, it is not surprising that the methods adopted for lifting the water are manifold, e.g., the Persian wheel, the picottah, the bullock mhote, the swing shovel etc. The depth of water to be lifted varies with the season and the lifting arrangements must therefore be able to accommodate themselves to work at different depths. It has often been suggested that the mechanical pump can replace with great advantage any, or all of the indigenous methods. Mechanical methods can only be adopted if the amount of water to be lifted both in volume and in height is sufficiently large. Actual experience shows that unless the engine can be kept at work for four hours every day, it is not any more efficient than the kavalvi.[23] Further, the employment of modern equipment could only be undertaken with profit on a well yielding 10,000 Cubic feet of water per day for the greater part of the year.

21. Because the vagaries of the weather were not carefully watched, the main stream changed its course and began to flow through the northern channel of the Coleroon with the result that Tanjore lost much of its former prosperity.

22. Indian Agricultural Commission Report 1928. Page 325.

23. kavalvi or bucket. See Department of Agriculture Madras, Bulletin No. 71. Page 22.

Expressed in terms of acreage, it appears that to justify the application of the smallest scientific lift, a holding should be not less than 10 to 15 acres in extent.[24] It is notorious how small the average holding of a farmer in India is, and how scattered his holdings are. There are few co-operative efforts on the part of the ryots to lift the water; each ryot attempts to supply his own requirements. In most cases, therefore, the quantity of water to be lifted is small and no mechanical device has yet been designed to satisfy such small requirements. Only the indigeneous methods, however crude they appear to be, meet such small demands. The various lifts which the farmer has in his control thus tend to become important. These may be classified into two:—(i) those in which bullock power is used and (ii) those where human labour alone is utilised.

The bullock mhote is itself of different types. In one type, a pair of bullocks move down an incline of approximately one in five, lifting behind them the bucket (kavalai) which is discharged by means of an ingenious tail. After discharge, the bullocks back up the slope until they reach the top, by which time the bucket will have again reached the surface of the water, when the process is repeated. In another type, the slope is made much steeper—one in three and a half, to one in two—and the animals are unyoked at the bottom of the ramp and return walking up a path at the side.[25] A third type is a circular one in which the bullocks walk in a circle on level ground winding up the rope to which the bucket is attached on a circular cylinder. The bullocks reverse while the bucket is discharging.[26]

Chatterton has shown.[27] that an animal can do twice as much work with the same ultimate expenditure of energy when engaged in raising its own body against the action of gravity than in any other manner. Hence with the much greater slope of the double mhote, the weight of the animals is much more effectively utilised and a bigger bucket can be lifted for the same size of cattle, if they have not to be backed up the ramp. The circular lift is the least efficient as the weight of the animals is not utilised at all, but

24. A. V. Williamson, 'Irrigation in Peninsular India' Geographical Review. Vol. 21 Page 626.

25. It is commonly found in Bellary, but is also found elsewhere occasionally.

26. It is commonly found in South Arcot.

27. Bulletin No. 35. Department of Agriculture, Madras. See also Chatterton 'Lift irrigation'.

only their strength; the animals have to exert their power by pulling a dead weight along a level surface.

Among those types in which human labour is utilised, the picottah is perhaps the most efficient; the co-efficient of utility is much higher in it than in any form of bullock mhote.[27] The only criticism that can be raised against it is its danger. The counterpoise lift in some form or other is still common. The bulk of the work in this case is done in not lifting the full bucket, but in pulling down the empty one; i.e., in raising the weighted end. Karim or trough lift is suitable for smaller heights. A variant of the trough lift is the swing shovel used in Malabar, where the water is usually shovelled uphill, the weight of the shovel being taken by a rope fastened to a tripod. For small heights, the swing basket employing two men to hold the ropes on either side is also used. The Archimedian Screw is extremely efficient for low lifts and has been introduced with some success in Tanjore for lifting the water on to lands just above ordinary irrigation level.

Thus manifold are the methods adopted for lifting the water in the various parts of India. It has already been shown that the small size of the average holding and the scattered nature of such holdings definitely bar the application of mechanical lifts. Reform is both possible and desirable. By consolidating the holdings several difficulties could be easily surmounted, but it is doubtful if it could ever be brought into effect. There is nothing inherently impossible in the government interfering directly in the lifting and distribution of water, making each village, or a group of contiguous villages, a unit. Otherwise, co-operative societies could be instituted under governmental supervision, each society being responsible for lifting and distributing the water required in each village. The entire holding in the village will then be treated as a single unit for this purpose, and water could be lifted and distributed much more economically than at present.

(To be continued)

ORGANISATION OF GOVERNMENTAL ADMINISTRATION[1]

By

E. Asirvatham

A question of vital importance to students of public administration is the organisation of administration. It is obvious that there can be no one type of administration suited for all kinds of States. An autocratic State will have one type of administration, while the democratic State will have another. Even among democratic States there is room for different types of administration. A State with a parliamentary type of government develops along certain lines, while a State with the presidential type develops along somewhat different lines. Once again, we find that the type of administration differs as between a federal State and a unitary State.

PRINCIPLES OF ORGANISATION OF ADMINISTRATION

Functionalism.—Although types of administration may vary according to time and place, it is possible to discover certain general principles which can form the basis of any sound administration. The first principle on which stress is laid by students of administration is functionalism. "One function, one department" seems a generally sound principle. According to it, departments are organised on the basis of the services performed. Thus there may be a department of national defence, a department of education, a department of health, and the like. The Machinery of Government Committee (1918), which gave much thought to this question, recommended the organising of departments of Government in Britain into I Finance, II & III National Defence and External Affairs, IV Research and Information, V Production (including Agriculture, Forestry and Fisheries), Transport, and Commerce, VI Employment, VII Supplies, VIII Education, IX Health, and X Justice. A similar classification recommended for the U.S.A. federal ad-

1. Part of a forthcoming book on Public Administration.

ministration by the Institute for Government Research is I State (foreign), II National Defence, III Treasury, IV Justice, V Post Office, VI Agriculture, VII Commerce, VIII Labour, IX Public Works and Public Domain, X Education and Science, and XI Public Health.

While the organisation of administration according to functions is a sound principle, it is not possible to apply it with absolute rigidity. Thus the department of Education is bound to trench on the question of health when it has to consider such matters as the building of properly-ventilated and well-lit school houses, the health and diet of children, and the like. This kind of overlapping is inevitable, and to avoid friction there should be a close collaboration between departments which have to deal with certain common subjects of administration. In the Secretariat of the Government of Madras informal consultations take place between Secretaries of departments when the matter under discussion concerns more than one department. But there is no legal provision for such collaboration in all cases.

However sound unifunctionalism may be as a principle, it should not be carried to an absurd extent. Thus it will be found that it is not in the interest of either economy or efficiency to centralise all the statistical, drafting, and typing work of the various departments on the ground of functionalism. Chemical analysis, for example, may be undertaken by various departments; and if the amount of work done by each department is considerable, it is not wise to centralise it. If, on the other hand, the chemical analysis work of one department is very slight and sporadic, it may secure the help of some other department where chemical analysis is an important item of business or seek the help of a central bureau or division of chemical analysis. In matters like the purchase of government stores, audit, and accounts, it is wise to have as large a measure of unified control as possible.

Where the legislature plans the organisation of administration, as is often the case in the U.S.A., far from departments being organised on the functional basis, they are organised in a loose and careless manner, resulting in a great deal of overlapping and inefficiency. L. D. White[2] quotes Secretary Redfield to the effect that at one time in the U.S.A. the protection of three Alaskan bears

2. L. D. White—Introduction to the Study of Public Administration, p. 61.

came under three different departments, the basis of classification being the colour of the fur of the animal! It is utter folly to authorise three or four different officials to deal with the same subject. It results in what the Haldane Committee aptly describes as "Lilliputian administration."[3]

Efficiency of Supervision.—While functionalism is a sound principle on which to organise departments, it must be remembered that the limiting factor is the efficiency of supervision. Functionalism should not be carried so far that it becomes impossible for the departmental head to have effective supervision over all the branches of work entrusted to his care. "It is said that an administrative superior cannot effectively supervise the work of more than seven divisions or units".[4] In cases where close co-ordination is necessary, there should be unifunctional organisation even if the volume of supervising work involved is beyond the capacity of any one individual. In such cases, other means should be devised for overcoming the inherent difficulties. To cite an example, it is an obvious advantage to have a Ministry of National Defence in order to have a unified plan of action and avoid friction and jealousy between the three fighting units—the army, the navy, and the air force. In a cabinet form of government, there may be one minister of National Defence with three subordinate ministers in charge of each of the fighting services. The business of the chief minister will be to co-ordinate the work of the three branches under his control and to represent them in the National Cabinet. The three subordinate ministers will not be members of the National Cabinet, but can have miniature cabinets of their own to guide and control them under the general supervision of the Chief Minister. The Haldane Committee suggests a similar co-ordination between the Home Office and the Lord Chancellor's Department under a Department of Justice with two Ministers, after relieving the Lord Chancellor and the Home Secretary of some of their present duties.

Functional and house-keeping activities. In close connection with the organisation of administration on the basis of function or the administrative service performed, W. F. Willoughby draws a useful distinction between the primary or functional and institutional or housekeeping activities of government. Functional activities are

3. Report of the Machinery of Government Committee, p. 7.
4. L. D. White—Introduction to the Study of Public Administration, p. 68.

an end in themselves, while institutional activities are only a means to an end. By functional activities are meant activities which are "based primarily on the specialised technology and professional background peculiar to a given organisation unit".[5] Institutional or housekeeping activities, on the other hand, are activities which minister to the needs of each department such as the sweeping and scrubbing of the floor, the sorting of letters, the filing of records, the recruitment and management of personnel, the custody and disbursement of moneys, and the preparation and submission of reports. These are activities which easily lend themselves to central control, especially when we are dealing with a large organisation unit such as the central or federal administration. If the volume of work involved is large, each main department may have its own centralised bureau or section for the management of its housekeeping activities. Such a bureau or section will look after the equipment and plant of the department, manage its personnel, disburse salaries, handle correspondence and files, and prepare departmental reports.

According to W. F. Willoughby, each department should, as far as possible, have provision for the following units in order to carry out its institutional activities:—1. Office of Chief Clerk, 2. Division of Mails and Files, 3. Division of Personnel, 4. Division of Supplies, 5. Division of Accounts, 6. Division of Printing and Publications, 7. Office of Superintendent of Building. All these units, says Willoughby, should be grouped together into a Bureau of Administration in each department under the supervision of the First Assistant Secretary, who would correspond to the Permanent Under-Secretary of the administrative departments of the British Government. One important advantage of such an organisation is that it will facilitate the drawing of useful comparisons between the work of the various departments or between the work of the same department at different times. It is interesting to note in connection with housekeeping activities that the Government of Madras maintains a well-organised Record Office where State papers and files which have passed into history are filed and kept for ready reference.

Staff and Line Functions.—In facilitating the efficient working of administration, students of the science of administration make a

5. J. M. Pfiffner—Public Administration, p. 58.

useful distinction between the 'staff' and 'line' activities of government and lay special emphasis upon the former if administration is to be conducted along scientific lines. The distinction between "staff" and "lines" activities is drawn from the German military organization where the staff officer does the thinking and planning, but does not issue a single order himself. His work is one of study and research, while the line officer is in charge of the combatant unit.

Administration is becoming so complicated to-day that without expert knowledge and advice, it is bound to be ploughing a wilderness of sand. The functions of the staff officer are planning, research, and investigation. His duty is to be helpful to both the chief administrator and the departments of government. In particular he is the eyes and ears of the responsible executive. In no circumstances he gives orders down the line on his own responsibility. "He is anonymous, the *alter ego* of his chief".[6]

Writing on the necessity of clearly distinguishing between "staff" and "line" activities with special reference to American conditions, Prof. H. Walker says: "In public administration staff functions are those which render services to government departments in order to keep them operating, while the line functions are those which render service directly to the people. Staff officers are the ones who make the plans, provide the machinery, and keep it running smoothly. The line officers are those who operate the machinery to provide the service to the public. Staff officers rarely meet the public. Line officers make public contacts daily. Staff functions must be closely co-ordinated and should be rendered by a single integrated organisation standing in close relationship to the chief administrative officer, who should in turn be the chief co-ordinator of all administrative acts of the government. Staff officers keep the chief administrator informed of what is going on throughout the administrative structure. They also serve as channels for the execution of his orders".[7]

Even in a country like the U.S.A. with its vast economic resources and expensive administration, there are no purely staff officers. Many of them combine research and planning with a certain measure of control and service, which is a mistake. The Bureau

6. M. E. Dimock, Modern Politics and Administration, p. 246.
7. H. E. Walker, Public Administration in the United States, Pp. 91-2.

of the Budget established in 1921 is the nearest approach to a pure staff organ. The Machinery of Government Committee (1918) in England came to the conclusion "that in the sphere of civil government the duty of investigation and thought, as preliminary to action, might with great advantage be more definitely recognised".[8] Those who formulate policy as well as those who are called upon to enforce it need the help of those who can collect facts and analyse them. It is their duty "to study the future, and work out plans and advise those responsible for policy or engaged in actual administration".[9] In providing an organization of this kind, the Machinery of Government Committee urge strongly "(a) that in all departments better provision should be made for enquiry, research, and reflection before policy is defined and put into operation; (b) that for some purposes the necessary research and enquiry should be carried out or supervised by a Department of government specially charged with these duties, but working in the closest collaboration with the administrative Departments concerned with its activities; (c) that special attention should be paid to the methods of recruiting the personnel to be employed upon such work; and (d) that in all Departments the higher officials in charge of administration shall have more time to devote to this portion of their duties".[10] The Committee further suggests that besides there being an Intelligence and Research service for the general use of all departments, each department, wherever necessary should have its own intelligence and research section "for the collection and collation of statistical material" and "for the prosecution of specific forms of research".[11]

In recent years much publicity has been given in the U.S.A. to the so-called "Brain Trust" of the Roosevelt Administration. This trust is composed of a number of keen technicians and experts whom Roosevelt has brought into his administration. Although not heads of departments, they are given key positions from where, with the help of the Assistant Secretaries of departments and other advisers, they are able to initiate policy. Such a device has proved useful in the U.S.A. where the Cabinet members are in most cases politicians and do not possess the necessary knowledge or skill to initiate policies.

8. Report of the Machinery of Government Committee, p. 6.
9. Report of the Machinery of Government Committee, p. 6.
10. Report of the Machinery of Government Committee, pp. 6-7.
11. Report of the Machinery of Government Committee, p. 32.

Under the stress of the present war Great Britain has followed suit by setting up a Brain Trust of her own. In India, too, the Central Government has appointed advisory committees of various kinds especially in the economic and in the field of scientific and industrial research. Special bodies are being set up also to deal with questions of national education and political reconstruction when the war is over.

While some of these committees may not have a useful part to play once peace is restored, there can be no gainsaying the fact that every modern administration requires the assistance of staff officers whose one business is to think and plan for the need of the people in advance and not to issue orders or conduct administration. An experienced administrator in the Madras Presidency holds that, while the provincial administration is on the whole efficient and comparatively inexpensive, it has not made enough provision for research and social engineering. The usual method of appointing *ad hoc* committees or special officers if and when the need arises is no longer suited for the complex conditions of our day. The administrator in question recommends a Council of Study and a Council of Administration for the Provincial Government. According to his scheme, there will be at the centre "a cabinet of Ministers deciding on policy and securing the enactment of legislation, working with a Council of study to inform it on the one side and a Council of Administration to carry out its policy on the other." The Council of Study is to consist of a Bureau of Investigation, a Bureau of Research, and a Bureau of Public Relations; and the Council of Administration is to be made up of a Board of Law and Order, a Board of Revenue and Expenditure, and a Board of Social, Economic and Technical Services. The value of this scheme consists in the fact that it makes a clear distinction between agencies of study and analysis and agencies of action. The Council of Study is not to be manned by Deputy Secretaries and Under-Secretaries chosen at random from the administrative service, but is to be composed of experts in their special fields. Their work will be statistical, analytical, and informative. On the basis of the classified information provided by them, ministers will decide upon policies and courses of action.

Need for an integrated structure.—From what has been said above it must be clear that for proper administration there should be integration and unified control. This end is sought to be accomplished by such means as Treasury Control and the chief executive

of a given administration acting as the general or business manager of his concern. Great Britain is often cited as the best illustration of unified control being secured by the Treasury. Sir Charles Harris writes: "In England the Treasury holds a peculiarly central position, different from that of the Ministry of Finance in any other country".[12] In the words of the Haldane Committee Report: "The treasury is a department of control and supervision rather than administration".[13] While not a public service department, it exercises general direction, supervision, and control over all the spending departments. It employs a variety of ways in checking up the needs of every department. Every individual promotion from the second division to the first requires its sanction. Appointments to the Civil Service Commission can be made only with its consent.[14] The annual estimates of the various departments are prepared subject to its detailed approval, and once these estimates are sanctioned by the House of Commons, no change can be made, at least in the direction of increase, except with the consent of the Treasury. This control is further strengthened by the scrutiny of the Comptroller and Auditor-General who is a Parliamentary officer independent of the Executive Government. His duty is "to examine all expenditure involved, and to report to the House of Commons cases in which he considers that the provision made in the estimates, has been irregularly varied or exceeded without proper authority."[15] Unlike most other countries, the Chancellor of the Exchequer or Finance Minister, has a "direct responsibility for the control of expenditure in addition to his duties in connection with the raising of revenue." The tradition has been that the Minister who is responsible for raising the revenue should also have a predominant voice in deciding on the amount, and in some degree on the character of the expenditure, although this practice has been resented at times by the spending departments. Commenting upon the soundness of this practice, the Haldane Committee writes: "on the whole, experience seems to show that the interests of the taxpayer cannot be left to the spending Departments; that those interests require the careful consideration of each item of public expenditure in its relation to other items and to the available resources of the State,

12. Journal of Public Administration.
13. Report of the Machinery of Government Committee (1918), p. 18.
14. The rest of this para and the succeeding para, contain a summary of the Report of the Machinery of Government Committee, Pp. 18 ff.
15. Report of the Machinery of Government Committee p. 18.

as well as the vigilant supervision of some authority not directly concerned in the expenditure itself; and that such supervision can be most naturally and effectively exercised by the Department which is responsible for raising the revenue required".[16]

While the "Treasury Control" has much to commend it, it must not be supposed that there is no room for improvement. The traditional attitude of antagonism between the Treasury and other departments should be modified in the interest of harmonious working. To this end the Haldane Committee recommends closer personal relations between the Treasury and the Departments and the acquisition on the part of the Treasury of a fuller knowledge of the work and difficulties of the departments. The practice of bargaining for funds between the Treasury and the departments should be replaced by an attitude of trust and co-operative endeavour. In the realisation of this end an advisory committee might be formed consisting of a few permanent heads of departments and a few persons with outside experience of business methods and problems, to whom might be referred general questions affecting the public service at large as well as specific proposals from departments. Further, a special officer might be appointed in each department to scrutinise proposals for public expenditure from the department before they are submitted to the Minister concerned for approval. There should also be a controller of routine duties in each department who would keep continuous records of the amount of work done, the time occupied in doing it, and the cost incurred to facilitate comparisons from year to year. Besides, there should be in the Treasury a separate branch specialising in "establishment" work and studying all questions of staff, recruitment, classification, etc., and routine business generally.

In India, too, there is something like the "Treasury Control" of Great Britain. The Finance Department prepares the budget in consultation with the other departments and exercises a close check upon all proposals for new expenditure. Part I of the budget in the Madras Presidency is prepared on the basis of "standing sanctions" and Part II deals with new schemes, which may involve loss of revenue or additional expenditure or both. If transfers of sums of money are to be made within a grant voted by the Legislative Assembly, the sanction of the Finance Department is neces-

16. Report of the Machinery of Government Committee, p. 19.

sary. The Madras Budget Manual states: "Except in certain cases in which reappropriation is not permissible, the Finance department has full powers of reappropriation within a grant, while the administrative departments of the Secretariat and the heads of departments exercise limited powers of reappropriation in accordance with rules framed by the Finance department".[17]

The U.S.A. did not have anything like "Treasury Control" till 1922 when a Bureau of the Budget was created. It is nominally under the Treasury department, but is really an agency of the President. The Director and Assistant of the Bureau are appointed by the President, and their appointment is not subject to ratification by the Senate. They hold office during the pleasure of the President. The primary duty of the Bureau is the preparation of the budget for the President. Through the Bureau, as W. F. Willoughby observes, "the President secures full information regarding the organisation, activities, methods of procedure, and needs of the several services, keeps in touch with all their operations, and does those things which a general manager ought to do in order to assure himself that their affairs are being properly conducted".[18] The Bureau, in other words, is a direct agency of the President in making his influence felt in the business activities of government. It comes very near to what Willoughby describes as a Bureau of General Administration. Or, to use the terminology of American writers, it is on the way to becoming a good staff agency. It is the instrument by means of which the President secures co-ordination between the various departments. L. D. White informs us that it deals authoritatively with the various departments of government and independent establishments. It revises and harmonises their estimates of expenditure. Acting on its suggestion, President Harding established in 1921 a Business Organisation of the Government of the U.S.A.; and the President and the Director of the Bureau meet with this organisation every six months. The Bureau is further represented on the Personnel Classification Board.

The State of Illinois follows the British system of making the Treasury the co-ordinating agency of administration. The Director of Finance is something more than a finance officer. His position

17. The Madras Budget Manual.
18. W. F. Willoughby: Principles of Public Administration, p. 64.

approximates to that of the Treasury in the British system. He prepares the biennial budget for the government and acts as an organ of general administration. His office, like the British Treasury, has no operating duties, the function of the collection, custody and disbursement of public funds being entrusted to other agencies. In the State of Massachusetts there is a commission on Administration and Finance organised under a Comptroller's Bureau, a Budget Bureau, and a Purchasing Bureau. This Commission exercises under the Governor as complete a control over the entire sphere of administration as possible.

The Chief Executive as General Manager.—Both White and Willoughby claim that if the control of administration is to be real and effective, in addition to there being a centralised budgetary system, the Chief Executive should be given the status of a General Manager. Here the American experience seems to be different from the British. In Great Britain, the legislature does not concern itself with the details of administration, nor does it seek to lay down in a minute degree the organisation of administration. In the U.S.A., on the contrary, there has been undue interference with the organisation and details of administration by the legislature. There have been times when the legislature went into such minute details as "fixing the exact number of clerks, technicians, and employees, by title and salary," forgetting that the proper function of the legislature is to lay down the general principles of organisation, scales of salary, modes of recruitment and do nothing more. "The internal organisation of each department should be determined by executive order on the recommendation of the department concerned and after report by some agency such as the United States Bureau of the Budget".[19] If administration is to be really efficient in a country like the U.S.A., the chief executive, says White, should be given the power of appointment, removal and supervision.

Willoughby who is in general agreement with White urges that the legislature should not directly control the details of administration, but indirectly through the chief executive acting as general manager who should be given the power "to direct, supervise, and control the operations of administrative services".[20] If the chief executive is to do his work properly, Willoughby believes

19. L. D. White—Introduction to Public Administration, p. 54.
20. W. F. Willoughby, *Op. cit.*, p. 39.

that the departments should be grouped according to their administrative services and that all of them should be placed under the general authority of the chief executive. The lines of authority should run from the administrative services through the chief executive to the legislature. Administrative reports should be submitted by or through the Chief Executive. This means that the Chief Executive should become the sole channel of communication between the legislative and administrative branches of government. All requests from the legislature for special information regarding administrative affairs should go through him and no subordinate official should be allowed to approach the legislative body directly. The chief executive should become the centre of responsibility for all administrative agencies. The budget, too, should be prepared and submitted to the legislature by the Chief Executive or under his supervision. The institutional or housekeeping activities of the administrative services also should come under his general control. His responsibility as general manager to the legislature is to see that administration is conducted honestly, efficiently, and economically. In securing this end, he should have the authority to appoint and remove the heads of administrative services, doing away with the present practice of a considerable number of administrative officers being elected by the people.

(To be continued)

PUBLIC SERVICE COMMISSIONS IN INDIA

By

R. SATAKOPAN

1. HISTORY OF THE COMMISSIONS.

(i) *Necessity for Public Service Commissions in India.*

So long as India was ruled by an efficient bureaucracy, there was no necessity for a Personnel Agency. The number of English-educated young men had also been few. The district officials appointed candidates of their choice with the formal consent of the local Government. The favour of the district officer sufficed in those days to secure an appointment.

But with the rapid increase in the number and quality of English-educated young men, a Board of Selection had to be set up; and a sort of competitive examination had to be organised. But this Board was a branch of the official world. High officials sat part-time to select candidates. If selection was by a competitive examination, the marks were not made public. No rankings were published. Selections alone were announced by the Government. There was not much objection, and the Indian bureaucracy had its way.

With the Montford Reforms politics crept into Government. The elective element came to wield power, and the dangers of indiscriminate patronage began to dawn on the public mind. Responsible Government became irresponsible in the distribution of patronage. It became imperative that public services should be guarded from political influence. This could be done only by the permanent establishment of some semi-judicial organisation, particularly charged with the regulation of service matters.

(ii) *Origin and Development of the idea.*

The idea of a Public Service Commission in India originated with the First Despatch on Indian Constitutional Reforms[1] dated

1. Paragraph 55.

5th March 1919. Five days later, the Functions Committee in its report[2] to the Governor-General expressed itself likewise. The Government of India Act, 1919, enacted[3] that "there shall be established in India a Public Services Commission of not more than five members of which one shall be chairman." Much discussion followed this enactment, but nothing was done for a long time. It was thought that there were few useful duties for a personnel agency in India.

The Lee Commission took up the question again in its report[4] of 24th March, 1924. It made a strong recommendation for an early establishment of the Commission. In October 1926, a Public Services Commission was set up in Delhi. The Government of India Act, 1935, also enacted[5] that "there shall be a Public Service Commission for the Federation."

The necessity for an impersonal method of selection was greater in the dyarchic provinces than in the bureaucratic centre. A Madras Government Order of 1922[6] reserved for the different communities in the province certain proportions of vacancies in the public services to redress communal inequalities. This made the need for a selection agency far more keenly felt. A Staff Selection Board was constituted in 1924. The Chief Secretary to the Government of Madras was its Chairman. The other members were the Surgeon General, the Director of Public Instruction, and two Government pensioners, recently retired from service, one from the judicial and the other from the Excise Departments. The experiment was tried for the Madras City only. Before it could be extended to the rest of the Presidency, discussions arose for the setting up of a provincial commission on a statutory basis.

After the Lee Commission had reported, the Government of India addressed all the local governments in 1924[7] on the necessity for a Public Service Commission. The Governments of Madras and Burma formulated proposals for the establishment on a statutory basis of Provincial Public Service Commissions. The Governor-General-in-Council telegraphed to the Secretary of State[8]

2. Paragraph 33.
3. Section 96-C.
4. Paragraphs 24 to 31.
5. Section 264.
6. G.O. No. 658, Public, dated 15-8-1922.
7. 1st July 1924.
8. 20th December, 1924.

for necessary permission to allow the provinces to try the experiment. It was granted[9] in 1925 on the understanding that the necessary statutory provision should be made by the provincial legislatures. In 1927[10] the Government of Madras forwarded to the Government of India a Madras Services Commission Bill for the sanction of the Governor-General.[11] This bill was forwarded[12] by the Central Government to the Public Services Commission at Delhi for its views. The Government of India also invited the Secretary of State to empower the local Governments[13] to constitute their own Service Commissions. The Madras Services Commission Act[14] was enacted by the local legislature in 1929. It was amended on two occasions in 1931 and 1932.[15]

The Government of India Act, 1935, necessitated a new Act to serve the interim period. A new Bill[16] was published in the Gazette[17] in October 1935,[18] was referred to a Select Committee, which reported on January 1936,[19] and became law next month.[20] After the necessary assent of the Governor[21] and of the Governor-General[22] it was published, along with the Regulations made by the Governor, in the local Gazette on 5th May 1936, from which date it came into force.

On the 1st April 1937, when the Government of India Act, 1935, came into force in the provinces, there was no necessity for any separate enactment, since the Commissions came to be governed by the provisions of Chapter III of Part X of the new Act. The Governor of Madras issued certain regulations under the Act, which did not materially differ from those published in the Gazette on 5th May, 1936.

9. 9th April, 1925.
10. 10th December, 1927.
11. Under Section 80(A) of the 1919 Act.
12. On 30th December, 1927.
13. Under Section 96(B) 2 of the 1919 Act.
14. Act XI of 1929.
15. Act No. IV of 1931 and Act VIII of 1932.
16. Bill No. 19 of 1935.
17. The Fort St. George Gazette.
18. 22nd October, 1935.
19. 10th January 1936.
20. 4th February, 1936.
21. Given on 26th February, 1936.
22. Given on 27th March, 1936.

2. CRITICISMS ON THE MADRAS COMMISSION.

(i) *By the Delhi Commission.*

When the Government of Madras sent the Services Commission Bill to the Government of India, the latter forwarded a copy of it to the Delhi Commission for opinion, which was received on 30th January, 1928.

The Delhi Commission was of opinion that the question of starting a local Commission could proceed only if an effective link was to be established between the two Commissions. Such a relationship was, in their opinion, very vital. If there was an unwillingness to constitute such a link, they wanted the matter to be deferred till the Simon Commission had reported on it. They argued that Parliament contemplated in the 1919 Act only one Central Commission. The local bodies, if they were to be constituted, must, according to their criticism, work under the Central body. But the provincial Governments had from the start objected to the extension of the activities of the Central Commission to their services. Based on this, the Government of India delegated to the local Governments[22a] the power to make rules, regulating the methods of recruitment to Provincial, Subordinate and Specialist services under their control. The Delhi Commission did not favour that this should have been so, even six months before they were set up.

The Delhi Commission also felt that the time was not yet ripe to have whole time provincial agencies. They quoted the Lee Report in support of this view. It was feared that there would not be sufficient work for one Commission for each province. The expenditure involved, they said, would not be commensurate to the services rendered. In smaller provinces especially, the appointments would almost degenerate into costly sinecures. Doubt was expressed whether, even in the Presidencies, the number of appointments would be 5 per cent apiece.

Absence of continuity was also advanced as an argument. This would disable the local agencies from gaining any experience

22(a). Under the Civil Services (Governor's Provinces) Delegation Rules of March 9th, 1926.

in the task entrusted to them. The range of the Central Commission was naturally wider and it could diffuse that uniformity of principles and practice all over India which it would be impossible to expect with one Commission for each province.

Whether the local Commissions could hope to remain immune from the political and communal dissensions that tear the province was another fear expressed by the Central Commission. Governments do not hesitate to press the claims of candidates they favour, and in the small community of a local government it requires considerable strength of mind to resist government pressure. The appointment of retired, or about to be retired, officers on the Commissions is no escape from the evil. To say that they are not affected by many affiliations to causes, creeds and even persons is a fiction.

Especially in regard to the exercise of disciplinary powers, and the disposal of general service questions, it would be safer to reserve certain powers to the Delhi Commission. A local Commission was neccessarily bound to be local and, however anxious to do justice, must be affected by the local conditions in which it lives and works. The Delhi Commission recommended that if the officer appealing so desires, the matter should be transferred to them. For the general service questions, the Central Commission, it was argued, would maintain uniformity, without disregard to the diversity of conditions.

(ii) *By the Local Legislature.*

The Madras legislature based its criticism of the Services Commission Bill on different grounds. It grew apprehensive of the way in which "the irresponsible government of the day" reserved large powers for itself, under the camouflage of a local Commission. The Government has reserved to itself large powers to make rules under the Act and also to prescribe the procedures to be adopted by the Commission. The legislature could not debate or vote upon the rules. Besides, the Commission had only advisory jurisdiction. The legislature felt that the local Commission took the form of an extra body to carry out the proposals of the Governments, a smoke screen for the government's injudicious distribution of patronage. It was feared that party government would be stunted in India by the party in power making an indiscriminate use of nepotism "behind the stalking horse called the Public Service

Commission." By itself prescribing the methods of recruitment, the Government was preventing the Commission from developing into an expert body on service problems.

(iii) *By Public Opinion.*

The public objected not to the establishment of a local Commission but to the way in which it was to be constituted. The bureaucrat, it was freely expressed, had been accustomed only to advisory bodies, and therefore he could not see beyond the mist of his traditions. The apprehension was strengthened by the failure of the Madras Government to accept and lay down, by rules, the principles enunciated in the speeches of Sir Malcolm (later Lord) Hailey in the Assembly and Sir Alexander Muddiman in the Council of State during the setting up of the Delhi Commission. A Madras Daily commented that the Madras Commission, as it was proposed, would only "constitute an additional set of officials for perpetuating the present unsatisfactory systems of recruitments and promotions in the provincial and subordinate services in Madras".[23]

3. THE COMPOSITION OF THE COMMISSIONS.

(i) *Qualifications.*

Sir W. E. Barker[24] prescribed a good many qualifications as essential if a Commissioner is to discharge his duties satisfactorily. He must have, first of all, an intimate knowledge of the Civil Service administration and the principles on which it is conducted. The Lee Report[25] also opined that he must appreciate the vital and intimate relationship which should exist between the state and its servants. He must have high judicial or other legal qualifications. There must have been, in his life, a complete detachment from all political and communal affiliations. He must have an intimate acquaintance with the educational systems and conditions in India. He should possess a capacity to conduct and organise examinations. He must have a knowledge, not necessarily profound, of most subjects taught in Indian Universities. In India, he must be a representative of a particular community. He should be fairly representative of certain interests. He must be a man of seniority and standing, with nothing to hope or fear from any government. Sir W. E. Barker felt that for the provinces, unlike as for the centre, it would be difficult to secure sufficient men with the above qualifications. "It would be difficult in a Commission of five members. It would be still more difficult in a Commission of three".

23. The Hindu, 24th January, 1929.
24. The first Chairman of the Delhi Commission.
25. Paragraph 28.

(ii) *Appointments to the Commission.*

Under the 1919 Act the Chairman and the Commissioners at Delhi were to be appointed by the Secretary of State in Council. Each was to hold office for five years but could be reappointed. Removal before the normal period was also by the Secretary of State in Council. The First Reforms Despatch of the Government of India on Indian Constitutional Reform[26] and the Report of the Functions Committee[27] endorsed the view that the composition of the Commission should be in the hands of the Secretary of State in Council. Only then, it was thought, could the Secretary of State's control over the services be made manifest, binding and effective. Not being nominees of the Government of India, the Commissioners had added prestige and glory.

The Madras Commissioners were first appointed in 1929 by the Governor-in-Council, but later the power of appointment was vested in the Governor alone. It was thereby intended to eliminate political influence in appointments to this semi-judicial body.

Under the Government of India Act, 1935, "the Chairman and other members of a Public Service Commission shall be appointed, in the case of the Federal Commission by the Governor-General in his discretion, and in the case of a Provincial Commission, by the Governor of the Province in his discretion".[28] Likewise, they can, by regulations, determine the number of members, their tenure of office, their conditions of service and also make provision for the other members of the staff and their conditions of service.[29]

26. Paragraph 55—dated 5-3-1919.
27. Paragraph 35—dated 10th March, 1919.
28. Section 265 (1).
29. Section 265 (2).

(*iii*) *Retired Officials on the Commission.*

Besides the Federal Services Commission, there is one Commission each for Madras, Bengal, the United Provinces and Assam. There is one joint Commission each for Bombay and Sind, the Punjab and the North West Frontier Province, and Bihar and Orissa.

The Chairman and most of the members of nearly all the Commissions are drawn from the ranks of the I.C.S. and of other services. The 1935 Act contains an express proviso "that at least one half of the members of every Public Service Commission shall be persons who at the dates of their respective appointments have held office for at least ten years under the Crown in India."[30] It only said "at least half," and therefore there has been a very liberal interpretation. Half of three, which is the usual number of members on the Commissions in India, is two and not rarely even three itself!

There are many inherent defects in the appointment of retired Civil servants to the Commission. "Among the qualifications which it would be very difficult to secure," emphasised Sir W. E. Barker, "I should specially mention the qualification of detachment. The official world of a province is a very small world and any one of sufficient prominence to be appointed to such a post is probably affected by many affiliations to causes, creeds and even to persons, which would shake public confidence in his impartiality. I am much afraid that these appointments would fall into the hands of persons for whom it was impossible to find other employment, pensioners who desired to increase their pensions, persons who had been useful to Government and persons whose activities it was desirable to neutralise. In short I fear the appointment of the very persons whose duty it was to secure the freedom of the public service from political influence would become an occasion for the most undesirable exercises of that influence".[31]

Officials, no doubt, bring to bear upon their work their wide experience, but the appointment of officials on the Commission is

30. Section 265 (1).
31. Simon Report, Vol. XV, page 205.

open to the same kind of objeections as are advanced against the elevation of members of the I.C.S. to judicial posts. The advantages are more than counter-balanced by the evils of officialdom.

(*iv*) *Party men on the Commission.*

In the United States of America the poison in party system is believed to be avoided by emphasising it and giving it representation. Thus they have bi-partisan Commissions. The American laws provide for three members on each Commission, not more than a majority of whom should be members of the same political party. The Commissioners serve six years each; one is named every two years. The executive is thus prevented from crowding the Commission with its own party nominees. The law there insists only on the appointment of men known for their devotion to the merit principle but this too is rarely observed. In Canada, too, the case has been the same. Though many did manage to rise above party politics, it is very difficult to revive public confidence once shaken by the inclusion on the Commission of party men with party careers behind them.

The appointment of party leaders to the Commission aggravates *the* trouble which it is the purpose of the Service Commission to avoid. It has more inherent disadvantages than the appointment of retired bureaucrats.

(*v*) *Removal.*

The power of removal is vested in India in the appointing authority. It is by the Governor-General in his discretion in the case of the Delhi Commission, and by the Governors in their discretion for the local Commissions. The normal period of office is for three years and reappointments are common.

In Canada, the positions are permanent subject to a certain age limit and removal is by the Governor-General, but only on an address by both Houses of Legislature. The idea is to make the body independent of the Government of the day. In India also, instead of this three years' term, an age limit may be substituted, on attaining which commissioners will automatically retire like the judges.

Removal by a joint address is also sound in principle. In Canada the Executive contrives to remove any irksome Com-

missioner in many ways. One method is by putting unnecessary obstacles in his way when he resigns out of sheer disgust. Or the Commissioner is offered a more lucrative post when he resigns with pleasure. Therefore Canada has introduced the principle of joint address. In India, a Commissioner is forbidden by law to occupy any other post under the Crown in this sub-continent, except on some other Commission, and secondly the Commission being mostly of retired members of the Government there has not, due to similarity in outlook and temperament, arisen any occasion for discord.

(*vi*) *Remuneration.*

Side by side with permanence of tenure, there must also be an attractive remuneration. The Chairman of the Federal Services Commission receives the pay of a Judge of His Majesty's High Court of Judicature—Rs. 4,000. It is also equal to the pay of a Secretary to the Government of India, of the Governor's Adviser, and of Resident I Class. The other Commissioners are paid Rs. 3,500 each. In Madras the Chairman receives Rs. 3,000 per month and the members Rs. 2,000 each.

The remuneration is fixed by the Governor-General in his discretion in the case of the Federation and by the Governors in their discretion in the case of the Provinces. It is non-debatable and non-votable.

4. THE FUNCTIONS OF THE COMMISSION.

(*i*) *Must be Non-partisan and Impartial.*

When the Provincial Reforms Committee questioned the Chief Secretary to the Government of Madras[32] as to what guarantees had been provided to keep the Madras Services Commission away from political influence and pressure, he answered:—First of all the appointment was by the Governor-in-Council. Secondly, "no person would be Chairman or Member unless he has previously given an undertaking to the effect that he will not either during or after his services on the Commission accept any other office under the Crown in India" except on some other Commission. Thirdly, here was a clause in

32. Sir A. Y. G. Campbell—Vol. XV of the Simon Report Questions 308 and 309.

the advertisement for vacancies, that "no candidate shall bring to bear or attempt by himself or by one on his behalf any undue influence on the Commission." Fourthly, the period of office was only three years and there was the fear that any political or personal misuse of power would disable a Commissioner from reappointment. Fifthly, the removal of the Chairman or the Commissioner was to be only with the personal concurrence of the Governor. Lastly, their choice was directed by the Communal G.O. The Chief Secretary hoped that with these safeguards, "the Ministers will be forced by public opinion as in England to follow the order set down by the Commission," and that the Commission was thus going "to be an effective security for the proper exercise of the impartial choice in filling the public services".[33]

Apart from these matters, there are certain things which the Commissioners should observe if they are to be above suspicion of partiality or partisanship. They must impose on themselves a self-denying ordinance. They should not enter into any discussion of political or other controversial topics. If not by law, at least by custom and tradition, they should refrain from ventilating their opinions. In other countries, especially in the United States of America and Canada, difficulties have arisen from the speeches of Commissioners, on topics even bordering on politics. The safest and at the same time the simplest solution is a total prohibition, as with Judges. They then raise themselves in the esteem of the public and the Government. They acquire that detachment of outlook, so essential for judicial and semi-judicial bodies.

In return, the Commissioner must be protected from public criticism or applause. He must be kept away from the public gaze. There is a positive duty vested in the Government actively to encourage, whenever and wherever possible, the healthy growth of independence in the Commission and its work. Responsible Ministers must constantly bear in mind that this duty to the Commission, as to the judiciary, is of paramount importance in the national interest.

"The chief danger the Commissioner will encounter" writes Dr. W. M. Dawson,[34] "is party influence and hence he should have as his

33. Question 320, Ibid.
34. The Civil Service of Canada, by Dr. Dawson—pp. 204—'5.

chief weapon independence from political control of any kind. He will of necessity become unpopular with certain Ministers, he will have to endure criticisms from the service and the public. Yet, in the midst of the turmoil, the Commissioner must preserve a strict neutrality, accompanied by scrupulous fairness and impartiality of decision. The protection and independence accorded him, therefore, can scarcely be made too extreme; for in no other way can he be impartial in decision and at the same time withstand the continuous buffetings of party supporters."

(ii) *Nature of Work.*—The Service Commissions are started as "politics-eliminators," as a mechanical contrivance "to keep the rascals out." The commission can be developed into an expert body on many questions connected with the Services. Such work may be quasi-legislative like the issue of rules and regulations, it may be quasi-judicial like the hearing of appeals, it may be administrative like recruitment, research, statistics, the issue of annual reports or it may be merely advisory like the giving of suggestions and recommenadtions on working conditions, health, welfare, recreation, etc.

(iii) *Schools of thought.*—As regards the functions to be entrusted to the Commission there are two opinions. One side believes that the Commission should be entrusted with the greatest number of responsible tasks, especially in countries where nepotism had reigned supreme. There is another side which preaches caution in the extension of the Commission's powers. The Commission, they say, lacks first hand knowledge of candidates after they had entered service, and they lack familarity with the nature of their work to use secondhand knowledge effectively. They use secondhand or third-hand reports and rely largely on objective and mathematical devices in measuring intangible things like the tact of the civil servant, his faithful service, his dependability, his power of decision in emergencies, etc. The Commissions in such circumstances peer owlishly at reports made by others, who have been possibly as ignorant, though as conscientious, as themselves. Sometimes a voluminious correspondence with comments and counter-comments emanates for so simple a thing as transfer or leave preparatory to retirement.

Sir Samuel Hoare felt that "it was the definite view of the Joint Select Committee, and it is the definite view of my advisers both here and in India that the Public Service Commissions had much better be advisory. Experience goes to show," he continued "that they are likely to have more influence if they are advisory than if they have mandatory powers. The danger is that if you give them mandatory powers you then set up two governments in a province, and two governments at Centre."[35]

But both the schools are united in maintaining that in matters in which the Commission is functioning, its recommendation must be made binding morally at least, if not legally. Or else the presence of a Commission becomes worse than useless, and the money spent on it a waste. It is best to appoint capable persons and place sufficient materials at their disposal. Their judgment is bound to be correct and it would be a travesty of justice not to accept it. There must be the binding force of either sound tradition or strong public opinion, both of which are dormant in India.

(iv) *The Main Functions.*—Originally, the idea was to invest the Commission with wide powers, as is the case in the Dominions. The Functions Committee laid down eight functions for the proposed Commission. They range from holding examinations, prescribing qualifications, and advising on service re-organisation, to proposing legislation or changes in the Regulation, advising the educational authorities as to the educational requirements of the public service, and acting as the interpreting authority in an advisory capacity when service rules were in dispute. But eventually they did not come to much, either at the Centre or in the Provinces.

The Government of India Act, 1935, lays down three provisions expressly in which the Commissions need not be consulted. "The Secretary of State as respects services and posts to which appointments are made by him, the Governor-General in his discretion as respects other services and posts in connection with the affairs of the Federation, and the Governor in his discretion as respects other services and posts in connection with the affairs of a province, may make regulations specifying the matters on which either generally, or in any particular class of case or in any particular circumstance, it shall not be necessary for a Public Service Commission to be consulted".[36] The second point is "as respects the manner in which

35. Parliamentary Debates, Vol. 300 Col. 858.
36. Section 266 (3).

appointments and posts are to be allocated as between the various communities in the Federation or a Province."[37] Thirdly, it need not be consulted on matters of recruitment and discipline to the subordinate ranks of the various police forces in India. Excepting these and "other matters" which the Governor-General or Governor in his discretion may refer to the Commission, the Commission "shall be consulted.

(a) on all matters relating to methods of recruiting to civil services and for civil posts;

(b) on the principles to be followed in making appointments to civil services and posts and in making promotions and transfers from one service to another and on the suitability of candidates for such appointments, promotions or transfers;

(c) on all disciplinary matters affecting a person serving His Majesty in a civil capacity in India including memorials or petitions relating to such matters;

(d) on any claim by or in respect of a person who is serving or has served His Majesty in a civil capacity in India that any costs incurred by him in defending legal proceedings instituted against him in respect of acts done or purporting to be done in the execution of his duty should be paid out of the revenues of the Federation, or as the case may be, the Provinces;

(e) on any claim for the award of a pension in respect of injuries sustained by a person while serving His Majesty in a Civil capacity in India, and any question as to the amount of any such award."[38]

The functions of the Public Service Commission may be extended by an enactment of the legislature but it reqires the previous sanction of the Governor-General or the Governor, each in his discretion. "It shall be a term of every such Act that the functions conferred by it shall not be exercisable

(i) in relation to any person appointed to a service or post by the Secretary of State or the Secretary of State in Council, any

37. Section 266 (4).
38. Section 266 (3).

officer in His Majesty's Forces, or any holder of a reserved post, except with the consent of the Secretary of State; or

(ii) where the Act is a provincial Act, in relation to any person who is not a member of one of the services of the Province, except with the consent of the Governor-General."[39]

(v) *Miscellaneous Functions.*—There are certain miscellaneous functions which the Madras Commission performs. It conducts language tests for probationers and certain Departmental examinations. It held for some time, but not now, the final examination of the Police Training School. It conducts voluminous correspondence, consisting of enquiries from candidates, references from departmental and official heads regarding the application of service rules and references from or consultations by the Government on service questions. The number of correspondence dealt with varies from 30,000 to 50,000 a year.

Of all the Commissions in India, the Madras Commission alone publishes an annual report. It is one of its most important functions. Reporting is said to be of the very essence of democratic control. In India it is all the more important because public opinion has to be aroused to its onerous responsibilities. This is most essential for the Public Services Commission, for it needs public support in its lonely battle against the government.

The Madras Report needs great improvement. It must rise above the level of a dry commentary which is published now. It gives a faithful list of its annual work. It does not see beyond the present. There is no comparative study, no masterly analysis of the subjects confronted. The Government is not represented as a social institution and the public servants are not depicted as belonging to a learned profession. Concrete instances are not anticipated in advance and abstract discussions on vital topics are not even dreamt of. There is no endeavour to reach the general public. No library, public or private, possesses a copy of the report.

The predominance of retired bureaucrats in the Indian Service Commissions can be said to have imported red-tape-ism into the management of personnel agencies also. Having been loyal servants of their benign Government it is idle to imagine them to put

39. Section 267 Proviso (b).

up a fight with the self-same Government even on any just cause. No doubt there will be comments and counter-comments and the net result would be an increase of files. Not accustomed to the influence of public opinion in their official lives, the tendency is to send protests to the Government in a purely departmental way. The public also views them as nothing more than so many limbs of the Government. Is it their mistake, then, not to realise that in championing the cause of the one they keep the Government within limits?

5. THE FINANCES OF THE COMMISSION.

The establishment of personnel agencies in India had foundered on the rock of the expenditures involved for their maintenance. Some provinces could not afford the cost of the show. There would not be sufficient work also for one Commission in each province. The 1935 Act therefore provided that "two or more Provinces may agree—

(a) that there shall be one Public Service Commission for that group of provinces; or

(b) that the Public Service Commission for one of the Provinces shall serve the needs of all the Provinces, and any such agreement may contain such incidental and consequential provisions as may appear necessary or desirable for giving effect to the purposes of the agreement and shall, in the case of an agreement that there shall be one Commission for a group of Provinces, specify by what Governor or Governors the functions which are under this part of this Act to be discharged by the Governor of a Province are to be discharged".[40] It is also enacted that if requested by the Governor of a Province the Federal Commission may, with the approval of the Governor-General, agree to serve all or any of the needs of the Province.[41]

The Madras Services Commission derives its income from two sources; fees from candidates for employments, and examination fees for the various tests conducted by the Commission. The expenditure column shows the pay of the Chairman, the members and the staff; the travelling and other compensatory allowances; the charges for advertisement; and contingencies like service stamps, rent for premises, remuneration to examiners, etc. Every year there is a deficit of nearly a lakh of rupees.

40. Section 264 (2).
41. Section 264 (3).

The salaries, allowances and pensions of the staff of the Commission including the Chairman and the members have been, under the 1935 Act, charged on the revenues of the Federation or the province as the case may be. It is unsound in principle that an indepent and semi-judicial body like the personnel agency should be perennially looking to the Government of the day for support and sustenance. It is possible that by a miserly policy any Commission can be reduced to a farce. The loss of its independence is the loss of its usefulness. Section 268 of the Government of India Act, 1935, safeguards the Commission against this evil.

To understaff the Commission with its growing work or to staff it on cheap rates with poor materials is bad. The Commission needs specialisation in the different branches of its work. This corresponding professionalisation of the staff means increasing pay and increasing expenditure. This should not be grudged. Frequent conferences between the Commissions in India will bring about healthy traditions of united endeavours. Uniformity of rules and procedures may be attained. This united action will bring about united strength which is so essential for the personnel agencies in our country treading on novel grounds in the face of omnipotent and omnipresent governments.

6. RESPONSIBILITY OF THE COMMISSIONS.

The question is often raised, to whom are the Commissioners responsible? We have seen that they are responsible to the removing authority for their good behaviour. But for their regular duties they are as little responsible to any one politically as the judges are for their judgments. They have, similar to judges, "a moral responsibility to their conscience, to their sense of duty, to their reputations, to their pride in the office or to any other influence which may dominate them".

The Government, on the other hand, are no more responsible for an appointment made by the Commission than for a decision rendered by the High Court. And in both the instances the same reliance is placed for the integrity of the work on the character of the officials. The Government and the legislatures are indirectly

responsible for the acts of the Commissions in that they appoint the Commissioners, pass the necessary Acts, frame the Regulations, place its budget above the whims and fancies of legislative votes, and continue that body with the requisite staff in office during their good behaviour. Beyond this the responsibility ceases.

But there is another responsibility on the part of the Government and the Legsilatures. They must not allow irresponsible aspersions to be cast on the Commissioners and their work. In India it is expected that in the fulness of time the Government and the Legislature will not only respect the independence of the agencies they have brought into being, but also encourage both passively and actively the spirit and the letter of the purpose behind the public service commissions.

INDIAN AIR TRAINING CORPS

THE ROYAL ROAD TO THE INDIAN AIR FORCE

The Indian Air Force is, at present, passing through a period of expansion and requires in increasing numbers the best representatives of the youth of the country. The formation at Universities in India of the Indian Air Training Corps is designed to instil airmindedness into that section of the youth of the country, which is educated up to the required I.A.F. Standards, and to hold before them the prospect of a definite career in the I.A.F.

The Scheme, by giving entrants a solid grounding in Air Force subjects, will give them a greater ability to absorb their subsequent service training.

GENERAL POLICY

All matters of policy will be decided by Air Headquarters (India) who will also be responsible for the issue of the syllabus of training.

FORMATION AND ORGANISATION

The Indian Air Training Corps will form a part of the University organisation. Application for the formation of an I.A.T.C. at each University Centre will be made by the Vice-Chancellor of the University concerned. On this application being accepted and after the organisation of the scheme has been put into effect, the administration and control of the training will become the responsibility of the Vice-Chancellor. This will be in all other than policy matters. He will be assisted by Air Headquarters (India) who will also be represented in the area to which the University belongs by a F|Lt. I.A.F. specifically detailed for this purpose.

INSTRUCTIONAL STAFF

The instructional staff will be drawn from the teaching staff of the University. Sufficient staff for the instruction of the courses formed at the University will be selected by the Vice-Chancellor. Instructors will go through a short course in technical and non-technical subjects, at an Air Force Centre. They will receive T. A. to and from these units at the rate applicable for 2nd Grade Officers. During the period of the Course they will be provided with accommodation and messing on the scale admissible to officer cadets.

EXPLANATION

(i) Briefly the scheme is to institute at Universities special Air Force Classes at which students will be taught the organisation of Air Forces, the theory of Flight, the working of the internal combustion engine, aircraft recognition, non-technical subjects like writing of official letters, elementary principles of Book-keeping, together with some Air Force drill and physical training. The Course will be an optional subject added to the normal curriculum of the University. It will last for a total period of three months consisting of an initial and an elementary course. During the period of these courses, trainees will receive a stipend of Rs. 20 p.m. with a free issue of uniforms with distinctive arm and cap badges. Uniforms will be worn during all periods of I.A.T.C. instruction.

(ii) All prospective entrants will be required to appear before a Selection Board consisting of the Vice-Chancellor of the University, the Senior I.A.T.C. Instructor at the University and the I.A.F. Officer assigned to that area. They will also undergo a medical examination by the University Medical Authorities prior to their acceptance as trainees. Entrants below the age of 17½ years at the beginning of the Course next following their application for admission will not be accepted.

(iii) Examination will be held at the end of both Initial and Elementary Courses. Trainees failing to pass the first examination will be required to resign from the I.A.T.C.

(iv) On the successful completion of both courses trainees will receive a suitable diploma.

(v) Successful trainees will in the first instance be taken into the service as aircraftmen second class.

The Scheme, as it stands at present, takes recruits into the ranks. Airmen, however, with power of leadership, intelligence and integrity will have every chance later of rising to commissioned ranks.

The information given in this pamphlet is not exhaustive and details are liable to change from time to time. Up-to-date information may be had from the Directorate of Training, Air Headquarters, India, New Delhi. This publication should not be quoted as an authority.

REVIEWS

WAR-TIME RATIONING AND CONSUMPTION.—(League of Nations, Geneva, 1942).

This is a very opportune publication, coming as it does at a time when rationing is seriously contemplated, and actually enforced in certain parts, in India. The methods of consumption control in war economy are discussed in the first chapter. The futility of mere price control without quantitative control over supply and demand is pointed out, and it is nowhere so patent now as in India. A descriptive account is given of the methods of control in the United Kingdom, United States, South Africa, New Zealand, Germany and other countries in Northern Europe.

What is most noteworthy is the improvement in the system of distribution of scarce commodities in this war as compared with the last war in the above countries. Thanks to the growth of knowledge on nutrition, particularly promoted by the League of Nations, food rations are now based so far as available supplies permit, on objectively ascertainable physiological food requirements of the people. Every Government aims at securing a minimum diet for the population as a whole, and consumption is guided not so much by individual purchasing power as by human wants. We find in this a step towards the fulfilment of the future reconstruction of the world based on Four Freedoms, of which Freedom from Want is the most basic.

We get a descriptive and critical account of the working of the rationing of food and other essential articles (clothing, housing, etc.,) the differentiation between different kinds of workers, based on calory and other requirements, the supply of free milk to children and nursing mothers, the provision for the supply of fat without which there is a sensation of 'hidden hunger', for eggs, vegetables and fruits—all 'protective' foods, the loss of which would result in inefficiency. "In the United Kingdom" we are told, "the average diet would even appear to be better than before the war". What an achievement in a country which before the war had to import more than half of her essential foodstuffs, while in India, we find it hard to get the quantity of rice or other cheap cereals and pulses we have been accustomed to, not to speak of the ever-growing scarcity of milk, ghee, fruits and vegetables, which are

said to be essential elsewhere but deemed luxurious here. We would recommend a close study of this timely publication of the League of Nations to all authorities concerned with food control.

K. C. R.

THE METAPHYSICS OF VALUE (Vol. 1): By K. R. Srinivasa Iyengar, M.A.; University of Mysore, Studies in Philosophy No. 2; pp. xxxi + 645; Price Rs. 5.

In this sumptuous volume of six hundred and odd closely printed pages the author expounds his theory of value through a criticism of rival views. The book consists of two parts. The first sets forth the general principles of value, and the second describes the specific types of concrete values.

Inspired by writers like Alexander, Lloyd Morgan, Dewey, and Perry, but agreeing with none of them completely, Mr. Srinivasa Iyengar expounds the principles of what he calls 'Normatics', the science of value. The moral philosophers, in his view, have been responsible for "the Great Error" of identifying ethics with the science of human well-being in general. Ethics is no more concerned with the *summum bonum* than economics is. It "forgets that its primary concern is with one only of the numerous values, viz., moral value, and insensibly transforms itself into the larger science of human welfare". The task of evaluating human experience as a whole belongs properly to Normatics, the science of human well-being *par excellence*. Evaluation involves the normative point of view. The norm or standard is the ideal to which the actual can only approximate. In origin the norm is subjective, while in function, it is objective. Individual minds generate the norms. "But after their genesis, they come to be objectified and acquire independence of individual acknowledgment or allegiance". The Realist is wrong in his view that value is a quality of the object. Value is neither in the object which has certain qualities nor in the subject who has certain needs, desires and purposes, but in the interrelation between the needs or desires of the subject and the qualities of the object. 'Value is not a "quality" but a "property" of the object, i.e., a feature newly acquired by it when it enters into effective relatedness with a mind.' Value emerges at different levels of human experience. It is created by desire out of the object. We regard a thing good if it satisfies our need. Goodness is the name we employ to denote a particular aspect in the objects —their aspect of satisfyingness in relation to desire. Thus value

is an emergent from the subject-object relation; it comes into existence in the process of appreciation. Emergence involves the rise of new qualities and new forms of relatedness. Unlike the Absolutist, the author believes in the reality of causation. "The effect is potentially contained in the causal substance; at the same time it must be recognised that the effect is a growth of the cause, its development into a different stage or state, and in this development into a different stage, new properties might appear in the effect which were not present in the old state of the cause". On the disintegration of the old the new emerges; and this is made possible because between the old and the new there is much in common as regards their essence and characteristics. Besides disintegration, there are positive processes—both subjective and objective—which cause the emergence of values in general. These values, since they are related to ends, are always relative in character. It is wrong to make a distinction between intrinsic and instrumental values, for all values are instrumental. Spirit which is worth or worthiness transcends value; it informs and guides the pursuit of values.

In Part II which covers the larger portion of the work the author discusses the emergence of specific types of value and gives a detailed description of each of these types. Values are classified into nine types (1) organic, (2) hedonic, (3) recreative, (4) economic, (5) personal, (6) social, (7) intellectual, (8) aesthetic and (9) ethical. After completing the survey of concrete values, Mr. Srinivasa Iyengar ends the volume with a chapter on Validity, Value and Worth. Validity is purely objective; it belongs to the nature of things themselves. Value is essentially subjective, though it has an objective reference. Worth or worthiness is spirit which is beyond all value.

The volume under review is the fruit of the author's vast learning and capacity for original thinking. He has spared no pains in gathering all relevant material, framing axiological problems and evolving solutions for them. He views his problems from a particular standpoint—I believe, theistic—and constructs a metaphysic of value. Without the philosophical implications of his theory before us, it is not possible to give a final estimate of the present work. The metaphysical implications of the theory of value expounded here are promised to be dealt with in another volume. But unfortunately Mr. Srinivasa Iyengar is no more with us to complete a work, part of which he has so successfully executed. It is to be hoped that the University of which he was a distinguished

alumnus and teacher will arrange for the publication of the second volume if the manuscript is ready for the press.

T. M. P. MAHADEVAN.

PESHWA MADHAV RAO I—A. C. Banerjee, M.A. (A. Mukherjee and Bros., Calcutta, 1943, pages 266).

This little book gives a very competent survey, detailed, critical and up-to-date, of the complicated political history of India in the decade following the third battle of Panipat; in spite of the disaster that had befallen them, the Marathas, under the leadership of their talented, but short-lived, Peshwa Madhava Rao I occupy the centre of the stage, and the work traces clearly the measure of success attained by them in the programme of recovery, and the limits set to it by the forces working in an opposite direction both among the Marathas themselves and from the side of their enemies. It exposes the selfish and tortuous nature of English diplomacy in India with telling citations from English sources, and generally lets each party say the best it can for itself. It is well documented and ably written, and we congratulate the author on this penetrating study of an important subject.

K. A. N.

CEYLON UNDER THE BRITISH OCCUPATION 1795—1833. The Political, Administrative and Economic Development by Colvin R. De Silva, B.A., Ph. D. (Lond.), Barrister-at-Law, Second Edition, 2 vols., pp. xi plus 639. The Colombo Apothecaries' Co., Ltd., 1942.

This book is the thesis on which the author won the Ph.D. degree of the London University in 1932. It is a thorough, systematic and well-documented survey of the events and transactions of the period of transition in Ceylon from mediaeval to modern conditions of life, work and government. The relatively short period of less than four decades studied in the book saw the transfer of the maritime provinces of the island from the Dutch into British hands, the extinction of the independence of the kingdom of Kandy, and the unification of the whole island under a single administration as a Crown colony after the control of the East India Company was ousted.

Political history is dealt with in the first six chapters (188 pages) and the rest of the book is devoted to Administrative and

Economic developments. The work is based on a thorough study of original sources and characterised throughout by sound and impartial judgment; it is also very well written. It deserves to take rank as the standard work for the period dealt with in it and the author who has had to arrange the publication while he was labouring under the disabilities of a detenu deserves to be warmly congratulated on his achievement. There are two maps, an exhaustive and critical bibliography and a very good index.

K. A. N.

THE NAYAKS OF TANJORE by V. Vriddhagirisan, M.A., M.Litt., Lt., edited with introduction by Rao Bahadur Professor C. S. Srinivasachariar, M.A. (Published by the Annamalai University, 1942). Price.

Among the historical publications of the Annamalai University, the Nayaks of Tanjore may be considered the most important and the most valuable. The history of South India is still to be re-written, nay to be reconstructed. In this work of reconstruction research books of the character of the book under review are particularly welcome. Mr. Vriddhagirisan should have taken infinite pains to compile this volume. The materials for this period are scanty and consist of a few epigraphs, indigenous chronicles, jesuit letters and the evidence of some foreign writers. It is gratifying to note that the young author has gone to the sources and has used the information obtained in a critical spirit, thanks to the guidance of Professor C. S. Srinivasachariar.

The foundation of the Tanjore Nayakship has been fixed in 1532 A.D., Sevappa Nayaka being the founder of the line. His son and successor Achyutappa ruled for over fifty years. His loyalty to his suzerain Venkatapati Raya led to a prolonged struggle between Tanjore and Madura. The next reign of Raghunatha, schooled in the administration of Achyutappa Nayaka, was all important. Apart from the wars and their victories including the help given to Jaffna, Raghunatha's reign is remarkable for the brilliant achievements, which were largely due to the vision and genius of his great minister Govinda Dikshita. Himself an authority on Carnatic music, he was a patron of learning and fine arts. He patronised both Sanskrit and Tamil literature. The southern school of Telugu literature contributed, among other things, to the introduction and development of the Yakshagana type of drama. His period again witnessed the advent of the

Dutch, the Danes and the English in the Tanjore kingdom. Now the Danes founded their settlement at Tranquebar. The last of the Nayaks was Vijayaraghava who had to resist vigorously the ever-threatening Muhammadan advance. He had besides to check the aggressions of Madura Nayak Tirumala and to endeavour to be loyal to his master Sriranga III. Notwithstanding the political turmoils during the whole of his reign, it was marked by a brilliant cultural activity. The succession of Chengamaladas, perhaps a grandson of Vijayaraghava, had to be effected by Vyankaji (Ekoji Bhonsle) in the peculiar circumstances of the time and this paved the way for the Maratha usurpation of the Tanjore throne about 1675.

Mr. Vriddhagirisan has done his task well and his book has no doubt enriched the history of South India.

V. R. R. DIKSHITAR.

THE NET-WORK OF WORLD TRADE. Economic Intelligence Service of the League of Nations, 1942. pp. 17.

This is a complementary volume to the earlier publication, namely, Europe's Trade. "This volume deals with, the relative importance of the trade of the various trading areas (geographical and political regions) of the world, dependence of the areas upon one another as buying and selling markets for a number of important primary products, and the net-work of trade channels that connect the groups and form a world-wide vascular system. Finally, the world system of multilateral trade is examined in the light of the figures of trade balances calculated for this purpose".

In the first section a complete and thorough analysis of the magnitude and composition of the trade in 1928, 1935, 1937 and 1938 of the whole world as also of the 17 groups of countries into which the world is divided is given. The value of trade is expressed in terms of the dollar of the 1934 parity, i.e. one dollar equalling 0.88867 gramme of fine gold. For 1928 the values in terms of the old dollar, i.e., 1.50463 gramme fine gold also are given. In addition the figures of the trade for the nine main political groups i.e. the powers and their colonies, dependencies, etc. are given. The composition of trade of each region is split according to the well-known Brussels classification and this is followed by an analysis of trade in certain important products.

The second section deals with the analysis of the direction of trade, and here the world is divided into eight groups, namely (1) Africa, (2) N. America, (3) Latin America, (4) Asia, (5) U.S.S.R., (6) Continental Europe, (7) Non-continental Europe and (8) Oceania. The division of America into two groups and Europe into 3 groups is explained by the special importance of the magnitude of trade of those particular regions. The inter-regional trade connections have been well brought together. This is followed by a small section on the trade of the "Anglo-American" group. The final and the most important part of the book is the analysis of the system of multilateral trade. Here the attention of the reader is first focussed on the system of multilateral trade as reflected by the orientation of balances of merchandise trade in 1928. Later a historical development of the growth of net-work of trade since 1860 up to the Great War of 1914-18 has been traced. This system suffered several stresses during the decade following the Great War I, and deteriorated during the Great Depression due to various economic and political causes. Before it could recover completely, the present war broke out. The section concludes with a note on the importance of the system of multilateral transactions in the future of world trade. As the previous volume, this volume has a good introduction, pointing out the scope of the statistical data used in the volume, copious annexes of nearly the size of the analytical part, which give a mine of information for people interested in more intensive studies, and also a brief summary of the results of the analysis under 17 crucial facts and conclusions.

As an objective study of the world trade, this volume maintains the high traditions of the other economic works of the League of Nations. There is nothing left to be desired in the analysis and the diagramatic representation of the facts. But both in this volume and the previous one, an under-current of bias towards the possibility of maintaining the present position of industrial countries of the west in the world trade is apparent. No doubt, since the Industrial Revolution and specially after 1870 the volume of world trade has grown enormously and all the above countries played a very large part in it. But this prosperity sowed the seeds of disaffection among the powers, and the deterioration of political relations between the powers is not a little due to economic causes. The ties between mother countries and Dominions, colonies, dependencies, etc., have been weakening. Though the need for a world pattern of multilateral trade remains, due to the variations

in climate and concentration of geological deposits, and uneven distribution of the factors of production, in future new factors are likely to modify the pattern of the world trade. This is one of the chief problems of the post-war reconstruction, and already economists, publicits and politicians are busy studying and pronouncing their views on these problems. For such studies, the objective analysis supplied by this and the previous volume will be found to be extremely helpful.

N. S. S.

DEVELOPMENT OF WILLIAM BUTLER YEATS. By V. K. Narayana Menon, (Oliver and Boyd, Ltd., 8/6 net.)

With much biographical detail and plentiful quotations from Yeats' prose-writings Mr. Narayana Menon offers a clear and interesting exposition of the long, continuous and complicated process of the development of Yeats. The essay is at once well-documented, well-balanced and pleasantly readable.

Sir Herbert Grierson, under whose guidance Mr. Menon worked on this doctorate thesis, contributes a charming reminiscential Preface on "the greatest poet that I have known in the flesh".

The chapter on *A Vision* considers "a mysterious book" which succeeded *Prometheus Unbound* and *Axel* in the series of Yeats' "sacred books" and reveals the whimsical, overcredulous and essentially private character of Yeats' metaphsics and traces the tendency towards authoritarianism which makes Yeats, like so many other famous modern European poets, a dangerous influence.

It is a pity that Mr. Narayana Menon (unlike his namesake in Benares) is either unwilling or unable to inspect English poetry from the Hindu point of view. Such inspection would confirm Mr. Menon's tentative conclusion that Yeats' work, lacking experience and belief, is only 'a personal document', though supremely great as such. A fine technical and imaginative artist, Yeats would not fit into the scheme of Protestantism or modern science, or Marxism, or Vedantism, all of which he knew but refused to take seriously enough. Thus with his intensely passionate individuality and his esoteric and fantastical philosophy, Yeats is a typical modern English poet, but certainly no poet for all time, no universal poet.

K. S.

CANDIDE. BY VOLTAIRE. Edited by C. K. Taylor (Basil Blackwell, Oxford, 6s. net).

Now that Britain is cut off from Europe, it has become necessary to publish French and German classics in England so that the study of the literatures of these countries may continue to be studied. Mr. Taylor is lecturer in French at Glasgow and has written useful notes for this new edition of "Candide".

This famous novel is almost as topical today as at the time it was written. The greatest figure of the Age of Reason, Voltaire made merciless fun of the philosophy of optimism elaborated by Leibniz. He is equally rude to the catholic orthodoxy of the period. Hyprocrisy, fanaticism and utopianism are as common today as then, and 'Candide' would need only minor alterations to bring it up to date.

B. A.

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