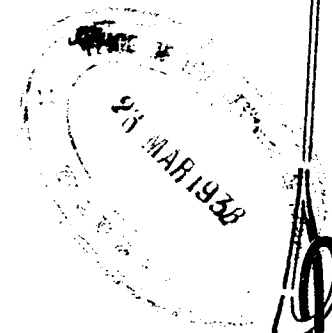


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No. 2.

THE MADRAS 448
Forest College Magazine.



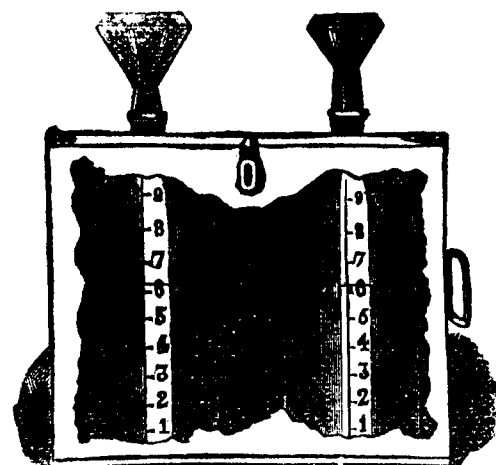
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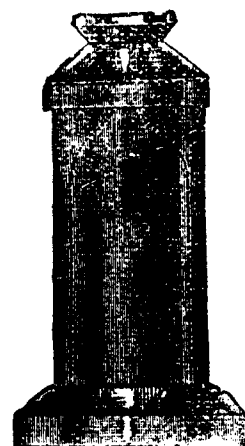
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The Madras Forest College Magazine

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THE
Madras Forest College Magazine.
(PUBLISHED QUARTERLY).

Vol. XX. DECEMBER 1935. No. 2.

*The Managing Committee do not hold themselves
responsible for opinions expressed
by contributors.*

Flying at Nedungayam.

By, P. W. Davis, I. F. S.

Those for whom the title might conjure up a vision of aeroplanes circling above the Rest House at this silvan spot will probably shudder, but they may rest assured that no such violence to the imagination is intended. Violence enough has already been suffered, for many remember the scene before such incongruous elements as masonry and latticed steelwork had "modernised" it and the old dugout ferry served to transport us to the other side. Nevertheless he whom duty calls to pass some six weeks at the close of the year at this camp needn't cavil at his job. For a prolonged stay tents are the thing, for there is ample shade under the trees just above the Rest House "compound" and one may thus also qualify, so to speak, as a residential member among the Nedungayam community (those commoners the grass ticks will be among the first to get acquainted !)

Managing Committee.

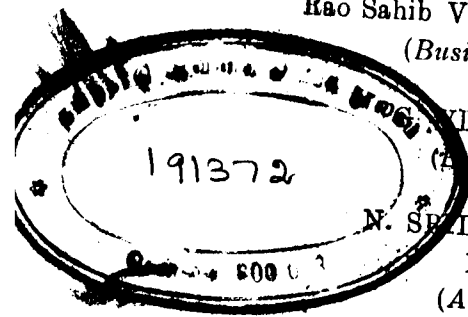
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There is plenty to interest you if you have a mind to take stock of the neighbours, and as there is a *Ficus* tree in fruit just by you, there will be many visitors at this time of year. In such circumstances one could hardly fail to observe, and in observing admire, the beauty and the numbers of the creatures of the air, for I know of no spot where they are more in evidence. Birds are constantly imposing their antics before you for your delectation — restless puckish creatures exhibiting a joyousness in existence and an emotional intensity which is infectious and which adds much to the habitability of the place. There is variety too in their aerial evolutions: the hovering of the Pied Kingfisher before he plunges upon his minnow, the masterly swoops and turns of the Drongos and Bee-eaters, the flashing little Sunbirds, the strong purposeful flight of the Imperial Pigeon, the arrow-like passage of the Parroquets clean through the foliage of some tree and out the other side, the heavy undulating flight of the Hornbills and the leisurely outspread pinions of the Brahminy Kite winging effortlessly along his beat. And these are not all. The achievement of flight has been gained by many creatures and varied are the means adopted. Essentially of course the problem is the same for all creatures, that is, the production of a more-or-less plane surface stretched out to enable the air to support the weight of the body against gravity. It is interesting to see in how many ways the problem has been tackled, even in this one restricted locality.

If you are here any length of time, you will observe something vol-plane or parachute past your nose from a branch of a tree to some other vantage-point. Having rubbed your eyes you are at liberty to verify the fact that it is really only a lizard and on the tree-trunk it

will show no visible means of its unusual progression, only it will appear to thrust out a long yellow tongue at you, on closer observation a kind of moveable membranous pouch seemingly hinged behind its jaws and receding again under the throat. This elegant little creature is one of the sole survivals of a dynasty of dragons and flying reptiles once a long time ago a dominant feature in this world's history. Nature here has evolved an extensible skin or membrane attached to the ribs; some millions of years ago certain members of this order obtained a "wing"-spread of twenty feet or more. But at most this mechanism can enable the creature to indulge in immense leaps, and it evidently was inadequate to secure the survival of the reptiles of the Silurian Age.

Then if you watch the surface of the river you will soon observe some small fishes making skimming leaps above the water for a dozen yards or so. Whether this is a form of *Joie-de-vivre*, or, as is perhaps more likely, an effort to escape the jaws of larger fish, I am unable to say. This is hardly a spectacular form of flying of course, but such leaps whether from land or water were probably the beginnings of flight in most creatures which have taken to the air. So-called Flying-fish are common in tropical seas, as are also the flying Gurnards, which are enabled to take prolonged leaps out of the water by means of enlarged pectoral fins outspread, and to sail with great speed through the air for distances up to 200 yards. There are also freshwater fishes in African and South American rivers which are able to emerge in a true, but not prolonged flight.

Very few mammals have been in this direction spite of their extreme adaptability in other directions.

The Flying Squirrel with which many may be familiar has adopted a method not very different from that of the Flying Lizard, i.e. a parachute or gliding apparatus. Only the Bat and Flying Fox, both of which are common in South India, may be said to have really mastered the art. I saw no Flying Foxes at Nedungayam, and even the bats were not numerous at this season; possibly the superior competition of the birds may have been too much for them, for with the multitude of Swifts and Martins in the air searching for food, bats might have a rather thin time of it. The Flying Fox of course is a fruit-eater. These curious volant mammals have become highly specialised and are worth a mention in this note. They have become equipped by means of greatly elongated fore-limbs from which is stretched the large fold of skin which acts as a wing, for flapping flight. This fold, beginning at the neck, is continued along the front surface of the arm, then stretches between the elongated fingers and tarsal bones, backwards along the side of the body to the hind legs. The movements of bats after flying insects are swift and adroit. How bats on the wing, even in furnished and artificially illuminated rooms, manage to avoid the obstacles which they seem ever about to collide with, must have interested many, especially as these animals are almost blind. It appears to be due to a highly developed sense of touch, aided perhaps by an extremely acute sense of hearing which enables them to become conscious of a feeling of reflected resistance in the air from near objects which excites them to turn and sheer off before coming into contact. Their prey—small insects—they must be able to hear rather than see, for they continue feeding for some time after dark and again before dawn. For these reasons they have really very little use for vision, which has become recessive. Bats are rather severely handicapped; as everyone knows,

they are helpless on the ground and must even come to rest in some crevice, or by hanging upside-down! Even in flight they are not equipped for long migratory journeys as birds are, and the architecture of body and limbs does not permit of their moving slowly through the air, of gliding from branch to branch, or of climbing upon ascending air currents as many birds do, nor (apparently) of doing anything in fact, which doesn't partake of the dire necessity of living. They have missed the brighter side of life, one has to be rather sorry for bats.

There are few if any places in India where the presence of that wonderful and versatile class of being, the insects, does not obtrude itself to one's notice in more ways than one. If you are infected with the virus which causes entomologists, Nedungayam is a good hunting-ground. The insects, of course, are undoubtedly clever, and they have been clever enough to furnish themselves with wings (one or two pairs) in addition to their six locomotory limbs, commonly called legs, and thus have lost nothing on the ground while gaining flight. In insects the wings are merely flattened extensions of body-wall from the thorax, worked by strong muscles at their bases — a supremely simple solution, but how did the idea originate and catch on? The dragonflies, which are numerous along any river-course, are noble exponents of this art, hovering and darting with powerful wing-strokes so swift in action that it is impossible to follow their scintillating movements in detail. Here there is superb muscular action which never seems to tire; quickly flying insects such as these and bees may have as many as 200-300 wing-strokes per second. Another kind of insect seen at Nedungayam, which would have resembled a flying dreadnought in the air was an enormous Cerambycid beetle, 5 inches in length and antennae as long as

its body, jaws of the most formidable construction and evidently a menace to whatever tree it chose for lodging and food! This is one of the largest beetles in India *Acanthophorus serraticornis*, and the individual seen was large even for its kind. It appeared as though with some fell intent of finding a home for offspring upon a *Garuga pinnata* tree, and had so sluggish a gait that one wondered how it ever overcame gravity in flight. The great additional weight of its outer wing-covers, or elytrae, which all beetles possess, must be a drag on flight, for I don't think these members are put to much use in the air being carried almost vertically, and as everybody knows, the larger beetles are clumsy brutes. But once again one could only marvel at the amazing muscular efficiency which can sustain such a bulk in the air by means of such a comparatively delicate vibrating membranaceous outgrowth. That many insects, such as species of Odonata and Lepidoptera (quite apart from the bees and locusts) do migrate considerable distance there seems to be sufficient evidence, but little I think has been worked out upon this subject. Nevertheless in insects, Nature has not exhausted her full powers, nor she assembled machinery sufficiently elaborate to permit of the full triumph of flight which is revealed in birds.

The machinery of the bird's wing and the dynamics of avian flight deserve special study, therefore. They have been carefully studied, for without the very evident achievement of birds it seems doubtful whether the genus *homo sapiens* would ever have confounded Nature outright by mounting in dizzy spirals upon that tenuous and precarious medium, the air, to drop "eggs" of an exceedingly unnatural explosive nature upon each other! curious also the thought, undreamed till last century, that birds—the very antithesis in character and habits

of the cold-blooded and sluggish reptiles—should by all unmistakeable signs have sprung from them; it is by comparison easy to think of man's progenitors as ape-like beings—and what an uproar that created! The earliest bird known from fossil remains—styled the Archaeopteryx—was certainly a tree-haunting creature, derived presumably from some arboreal reptile, for it had teeth, a long tail and a number of claws on the wings; yet it had feathers—and feathers perfectly developed. Feathers are a peculiar patent of birds alone, and they are very complex things. The manner in which the wing developed is largely conjectural, and of no importance here. But even now it is not in essential framework different from the forelimb of a man or other vertebrate. The tip of the wing, carrying the pinions, corresponds to the hand and fingers, although many of the component bones are lost being not required by birds while those persisting have become welded to form a slender flail adapted to cut through the air on the downstroke of the wing. The wing as a whole can be folded when not in use, or completely outspread as during climbing, very slightly bent as when the bird is gliding, or bent considerably at the "elbow" and "wrist" joints when he is descending steeply or swooping upon his prey from above. Besides the flapping motion of the wing vertically, it can be freely rotated backwards and forwards, and various portions of the wing can be made to offer different angles of incidence against the air. The flight feathers themselves are made to execute individual movements, so that on the upstroke the air is allowed passage through the wing, lessening resistance and enabling it to be flicked up rapidly. Extraordinary multiplicity of muscular action is thus brought into play during flight, for these wings combine in one the

functions of both aeroplane wing and propellor. The familiar "slotted" appearance of the primary or outer pinions of such birds as vultures, eagles and the like, especially seen when climbing, has been copied in the so-called "slotted-wing" fitted to some types of aeroplane, which enables the machine to climb at a greater angle and also provides a measure of greater safety and control when air-speed is lost and the machine tends to "stall". The tail-feathers are also constantly in use for giving balance and stability, as well as in aiding direction. Now watch the vulture cast off from the ground or a branch and climb laboriously with heavy wing beats in an upward spiral until he has reached a certain height from the ground; then watch the change. The flapping becomes less and less vigorous, and finally ceases. The bird does not cease to climb, but now he glides with outstretched pinions in majestic spirals for 1,000 or 2,000 feet and without apparent further effort is able to sail in any pace. This is clever mastery of the air itself, for the birds of prey especially, which remain for long hours on the wing without coming to rest, have perfected the art of gliding upon air convection currents, allowing them to take them whichever way they will. Vertical upward currents of air are very appreciable especially in tropical countries, at a little distance from the ground. Similarly one could watch the Brahminy Kite at Nedungayam flying sometimes into the wind and without vulgar flapping movements, progress almost inexplicably forward. One could undoubtedly pursue this rather fascinating subject further. Suffice perhaps to note merely that it is in the immense seasonal migrations of certain species that the triumphant superiority of bird flight is most clearly manifest, for such enormous distances must involve remarkable

endurance, amid many sorts of weather. The Arctic tern flies from Pole to Pole twice a year. The swift can fly from India to Europe in a matter of only a few days, rivalling in time the Air-Mail service! The Snipe comes annually from the Siberian wastes to winter in India and again returns there in Spring. The curlew-sandpiper, when only three months old, migrates from arctic Siberia, to New Zealand! All bird migration is roughly from north to south and *vice versa*. Malabar, lying near to the southern extremity of India receives only winter visitors. Whistler writes in his "Popular Handbook of Indian Birds":- "India lies south of the great mass of Northern and Central Asia, where winter conditions are very severe following on a short but luxuriant summer. It is not strange therefore, that a huge wave of bird-life pours down to winter in India where insect and vegetable food is so abundant. The movement starts as early as July, and reaches its greatest height in September; it crosses the Himalayas from both ends, and gradually converges down the two sides of the Peninsula spending its strength until it ends finally in Ceylon. In spring the wave again recedes, starting at the end of February, and all the migrants have gone by the end of May". From two years' observation, I am certain that many birds reach Nedungayam only in December, although I expect that the actual times are governed by the rainfall and the general climate conditions of the year. There are many unsolved mysteries however about bird migration. Why with others, such as the swallow, are the young the first to leave the breeding quarters in the far north to take their stupendous adventure southwards without guides across the great Himalayas barrier? When they start on journeys, have they any fixed ideas about where they are going to land up? As

the Professor Newton put it: The flow and ebb of the feathered tide has been sung by poets and discussed by philosophers, has given rise to proverbs and entered into popular superstitions, and yet we must say of it still that 'our ignorance is immense'. What is needed in India is observers. This is a subject in which anyone who is interested can help, by taking accurate notes on the birds of his station throughout the year, noting those which are resident and those which arrive and depart and the dates, their abundance and so on. This we have started to do now on the Forest College estate, as part of our general ecological survey.

COLLEGE NOTES.

1. The Madras Forest College Athletic Sports, 1935.

The College Athletic Sports were held on Saturday, 26th October last. The weather was rather hot, but there was not the usual interference by rain, and the programme was successfully gone through. It is gratifying to note that while no records were broken the previous year, three were broken this year. Senior student T. J. Abraham won the Richmond Cup with twenty one points, and broke three records. We offer him our congratulations not only on his winning this but also on his gaining the Raja Olympic Medal* at the close of the Olympic sports (on 2nd November last), for collecting the largest individual score amongst about 160 competitors from Coimbatore and surrounding districts, an excellent performance after a week's ordeal of examinations in the college.

The prizes for the college sports were kindly distributed by Mrs. Holdsworth, the wife of the Collector of Coimbatore. The following are details of the events:-

I. High Jump:-

1. T. J. Abraham ... 5 ft. 4½ in.
(Record: 5'-1½").

2. P. Gopala Menon.

3. K. R. Radhakrishnan

II. 100 Yards:-

1. Dileep Singh 11½ sec.

2. K. R. Radhakrishnan

3. C. C. Monappa.

*As will be seen from the account of the Swimming competition held at Nedungayam in December, he has added another feather to his cap by winning the medal for swimming.

- III. *Javelin throw*:—
 1. T. J. Abraham 119'-7½"
 2. B. M. Bopayya.
 3. C. C. Monappa.
- IV. *Quarter mile*:—
 1. Dileep Singh. ... 57½ Sec.
 2. C. J. Nanjappa.
 3. T. J. Abraham.
- V. *Shot-put*:—
 1. T. J. Abraham 30 ft. 3 in
 (Record: 27'-7").
 2. C. C. Monappa.
 3. C. J. Nanjappa.
- VI. *Hurdles*:—
 1. Gopala Menon 19½ Sec.
 2. Dileep Singh.
 3. Radhakrishnan.
- VII. *Open half-mile*:—
 1. Antony Joseph.
 (St Michael's School) ... 2'-11"
 2. C. Konian.
 (Union High School)
 3. N. Munisamy
 (Union High School)
- VIII. *Long-Jump*:—
 1. T. J. Abraham 18'-1½"
 2. B. M. Bopayya.
 3. P. Gopala Menon.
- IX. *Peons' Race*:—
 1. Syed Ali.
 2. Krishnan.
 3. Swaminathan.

- X. *Mile Race*:—
 1. B. M. Bopayya 5 mts. 33 sec.
 2. Sivaramakrishnan.
 3. P. K. Patnaik.
- XI. *Relay Race*:—
 1. Madras—A.
 2. Madras—B.
- XII. *Cycle Race*:—
 1. N. P. Choksi.
 2. B. M. Bopayya.
- XIII. *Tug of War*:—
 Won by Senior Division.

2. Camp Notes — Mount Stuart — (Nov., Dec., 1935).

This year the camp was shifted from Topslip to Mount Stuart to facilitate the work, as most places where our work took us are within easy reach of Mount Stuart. Besides we had the old forest quarters to occupy, and according to many we were spared the slight inconveniences attendant on a long stay in tents. But this change from Topslip to Mount Stuart was bad for the general health of the camp and only a few escaped the malarial infection.

During the first fortnight we had a good lot of rain, and on the 15th, 16th and 17th of November we had a heavy downpour, the result of which was, many minor landslips on the roads from Topslip to Anapadi. Naturally we had no difficulty about the water supply of the camp. During this rainy period we enjoyed some magnificent scenery in the mornings, the valleys below us were a sea of clouds, and here and there some hilltop above the clouds presented the appearance of some fairy islands.

As usual we had an interesting excursion to the Richmond Saw Mills, at Palacadavu, and most of us thoroughly enjoyed our unusual mode of travel on elephant backs. We started on the morning of the 25th November, and after passing a night at Palacadavu, we returned to camp on the 26th to find that an unusual incident had taken place at Mount Stuart. A young calf of our milkman, while grazing about a mile off was preyed upon by a panther. Unfortunately (and fortunately for the panther) the First Senior Instructor was not informed of the incident in time, or perhaps it might have been a different story.

Another very interesting excursion we had was to the elephant camp at Sungam, where the 9 months old cub Mirabai was very amusing and interesting to one and all, with her frolicsome ways and pranks.

N. P. CHOKSI,
Junior Student.

3. Swimming Race. (Nedungayam).

The practical examination in Silviculture held by the working plans Conservator was just over, and every one was care-free, but busy all the same, packing his things lustily for the ensuing departure for the x-mas vacation, when the annual Swimming Competition for the Seniors was held at Nedungayam on Monday the 16th December at 3 P. M. in the Karimpuzha river. As usual the course consisted of a distance of 400 feet down the stream from the Karimpuzha bridge. On the bright sunny afternoon, the weather being very fine, and the starting and winning points gaily decorated with flags and festoons flying merrily in the pleasant air, the whole course presented a charming and spectacular appearance,

The working plan Conservator W. G. Dyson Esq., who was kind enough to be present on the occasion arrived enthusiastically on the spot along with the Principal and the second Senior Instructor, at the appointed time. Though a few of the students were disabled from participating in the competition due to indisposition, nonetheless it was adequately represented and also ~~well~~ contested. The Principal & Mr. Dyson acted as the Judges while Mr. Mitchell, our Instructor, was the starter. The Havildar was ready with the bamboo raft, as a precautionary measure, to afford immediate help and rescue, should such a contingency arise.

Thus the race was started, all the competitors rushing forward cheerily, summoning to their aid all the energy at their disposal, and trying hard to outwit each other. But after a while, nay, even from the very beginning, Abraham with his indefatigable energy, inimitable ease and simplicity of style, began to lead & by the time he reached the winning post, the other competitors fell far behind him. Thus showing a remarkable difference, he won the first place and thereby vindicated his reputation and versatility worthily as the Year's Olympic Champion of the Coimbatore Athletic Sports ought to. Our congratulations to him.

Next to him were coming Md. Alikhan and Gopala Menon, both struggling hard and keeping pace together and every one expected it to end in a dead heat between them. But while nearing the winning point Mr. Alikhan fell back mysteriously, and by a few brisk strokes of the hand, Gopala Menon came out to be the second. The rest of the competitors completed the course easily.

Two other tests were also held one for the beginners and the other for the inexpert swimmers,

Nanjappa deserves our special congratulation for the simple reason that though he never knew the A. B. C. of swimming when he came to the camp and used to go down under water like a brick, as our Instructor remarked, gulping down gallons of water almost everyday, still, on account of his sheer perseverance and singleness purpose, not only learnt swimming but also took to the water like a duck and won the 1st place along with Hussain in the 50 yards race for the inexperienced swimmers. Our congratulations to him also.

4. M. F. C. Athletic Club.

As usual, the various games were pursued vigorously, more attention being paid to the practice in Athletics on account of the Coimbatore Olympic Sports which was to come off on the 1st and 2nd November, 1935 immediately after the College Sports: we played a Hockey Match with the Stanes European High School; But due to lack of understanding and cooperation among the forwards, along with want of adequate practice, we did not fare well in this.

But we are glad to announce that T. J. Abraham of the Senior Division, won the championship in the Olympic Sports, knocking off the Rajah's Olympic Medal, a unique distinction achieved by him against heavy odds and also setting up new record in the Javeline throw. Our hearty congratulation to him.

As a matter of fact, we ought to have got the aggregate cup also (which we earnestly expected) but for the coming in into the arena, for the first time, to our ill-luck, of the King's own Royal Regiment, Wellington, Nilgris, who were more than a match for us. Nevertheless we took a firm stand, and put up an unusually vigorous fight, as a result of which we narrowly missed the Aggregate Cup, by a very small difference of 4

points: The former got 29 whereas we got 25 a handsome number, considering the fact, that no other institution came anywhere near us, as regards the total number of points scored, the third getting somewhere about 10 points.

Our thanks are due to the Principal for all the trouble he has taken in coaching the competitors for the above sports, and also for the keen and continued interest that he evinced in the Athletic activities of the Club.

The Principal has been pleased to nominate, the under mentioned students to the respective offices shown below:—

Vice-Captain, Cricket:— Kumar Dipleep Singh.

Vice-Captain, Hockey:— E. G. D'Souza.

Vice-Captain, Football:— M. Abdul Khadar.

Vice-Captain, Tennis:— B. D. Madkarni.

Assistant Secretary, Athletic Club:—

A. G. W. D'Sylva.

Our congratulations to them.

K. R. RADHAKRISHNAN.

5. New year Honours:

We are glad to note that two of the Forest Rangers of this Presidency figure in the New year Honours list. A "*Rao Sahib*" has been conferred on M. R. Ry. S. Rangaswami Ayyangar, M. R. Hons., Research Ranger, Denkanikota, and a *Kaiser-i-Hind* medal awarded to M. R. Ry. T. M. Duraisami Pillai M. R. Hons., Nellore. Our congratulations to them.

Sylviculture of Sandal.

The following is an abstract of lectures delivered by Rao Sahib Mr. S. Rangasami, M. R. Hons., during certain excursions with the Senior Division students of the Forest College in North Salem Division.

1. *An obligatory parasite*: By watching the effect of excluding all hosts from a Sandal tree by digging a deep trench all round, and comparing the condition of the Sandal with that of an untrenched Sandal (as a control) it has been established that Sandal is an obligatory parasite.

2. *Nature of hosts*: Leguminous hosts are more highly parasitised than hosts of other families.

3. *Influence of hosts*: Hosts exercise a great influence on the rate of growth, production of seeding, germinative power of seeds, heartwood formation etc. *Erythroxylon monogynum*, *Semecarpus anacardium*, and *Strychnos nux-vomica* are among those which promote intensive heartwood formation.

4. *Resistance to diseases*: Seeds with four ridges or "veins" on the testa are found to give rise to plants which are more disease-resistant. Seeds coated with the paste of the root-stock of *Acorus calamus* (a marshy aromatic herb, often cultivated; root-stock sold in the bazaar) are found to keep off rodents etc.

5. *Viability of seeds*: 25% to 40% germination upto one year and 6% in case of seeds 28 months old. "Seeds from which the pulp had been removed before sowing give better results than those which had the pulp left on."

6. *Regeneration*: The normal seeding seasons are June to September, and November to January. Propagation by root-suckers is easy enough. In areas where there is good growth of Sandal, seedlings enough to restock the area survive. Where it is sparsely distributed artificial aid is necessary. The absence of regeneration in many areas is caused by (i) rodents (ii) fires (iii) trampling and browsing by cattle and wild animals (iv) damage to seeds due to excessive sun and rain (v) smothering of seedlings due to excessive weed growth, and (vi) drip and dampness.

"Sandal is not found in dense high forests of good growth but occurs mainly in open scrub forests hedgerows, among Lantana bushes or bamboo clumps and round the edges of cultivated lands" Troup. It is believed that birds are very discriminative in that they are able to select particularly good and healthy fruits, and seeds passed through them and dispersed by them yield a very high germination and disease-resistant trees.

Artificial regeneration is by (1) direct sowings (2) sowings in beds and transplanting (3) stump-planting — different ages of stumps. (4) planting pieces of roots. "An experiment in stump planting sandal in N. Salem Dn. has given 98% survivals after three years, with an average height of 4' 5." Stumps 1½ to 2½ years old are the most suited. In an experiment at Denkanikota 24 pieces of roots from ¾ in. to 1½ in. diameter were planted monthly throughout the year. Sprouting varying from nil in seven months of the year to 25% in both August and September planting was obtained." In all cases a suitable host should be planted near.

7. *Tending*: The following points are to be borne in mind: (1) maintenance of good hosts and their tending, and avoiding damage to the hosts, (2) providing for free and natural expansion of the crown, (3) gradual freeing of suppressed plants (4) providing a light shade to avoid sun-scorch, (5) free overhead light (6) replacement of undesirable hosts by suitable ones (7) avoiding a heavy growth of grass and herbaceous plants so as to prevent root-competition, water-scarcity and bad aeration.

'Spike' in Sandal:

1. *A virus disease*: Spike disease in Sandal is caused by a virus. A virus is an infective principle of extremely small size (below the resolving power of the ordinary microscope), which is able to pass through the pores of a filter candle, and is incapable of multiplying in the absence of a living cell. It is so small as $\frac{1}{5000}$ m. m. in diameter! Small pox, influenza, rabies etc., are examples of virus diseases (in the animal kingdom).

Spike-like symptoms are sometimes caused by physiological factors such as drought, certain kinds of hosts, or other causes. The test for real spike in a tree lies in the transmissibility of the disease from it to a healthy tree. This is done by grafting a small bit of the tissue of the diseased tree — a piece of leaf or bark — on to a healthy tree. Sap transmission has so far been found to cause no spike. The minimum period for spike transmission is about 55 days.

An instance of a sandal tree looking spiked but not really diseased is furnished by a peculiar tree in Noganur

(N. Salem) kept under observation since 1926. All known methods of disease transmission tried in this case from this tree on to a healthy sandal were found to cause no infection.

A common method adopted to test if a tree is infected and has the disease 'masked' (or hidden) in it is to lop all branches, and see if the flush of leaves is normal or not. Spike symptoms are easily brought out in this way.

2. *Symptoms of spike*: By now, these are well known. The internodes get shorter; the leaves turn a sickly yellow and brittle and dwindle into mere bristles which grow stiff and erect like a 'spike' or chimney brush. When the onset of the disease is sudden a phenomenon called 'phyllody' is common; the stamens of the flowers tending to become flattened into leaf-like organs or 'phyllodes.' An excess of starch in the leaves, and the presence of vacuolated intracellular bodies attached to the nuclei of the leaf-cells are also often associated with the disease.

It has recently been found that a sandal tree masking spike in it is generally profuse in its fruiting and the period during which such a tree bears fruits is longer than normal.

3. *How caused*: Neither the exact way in which the disease is caused, nor the vector or vectors that carry the infection have yet been discovered. Elaborate experiments conducted in Bangalore and North Salem, by growing sandal plants on platforms above the ground, in cages of meshes of different gauges, in cloth covers with small celophane windows etc., go to show that the disease is possibly transmitted by one or more insects.

among a large group, which is being narrowed down gradually by elimination; the transmission is by transference of a bit of tissue and not sap, from the diseased tree, by a biting insect.

4. *Control measures*: In areas where trees are already spiked the only method of control is to uproot such trees and burn them. In places which are in the line of spread of the disease, a good precaution is to provide the sandal with such hosts as impart a disease-resisting capacity, and using four veined seeds which are believed to yield sandal with 'autogenic,' or self resistance. Such plants in addition to the autogenic resistance have an acquired one through proper hosts.

An extension of pot-culture methods on to a cultivation on big mounds of earth -- which prevent the interference of roots of unwanted species and make the nearest approach to natural field conditions -- has given the following percentage of power of resistance imparted by hosts to sandal (in Javalagiri in N. Salem):—

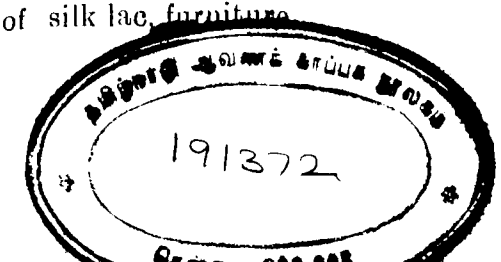
<i>Azadirachta indica</i>	}	99
<i>Strychnos nux-vomica</i>		
<i>Semecarpus anacardium</i>		
<i>Cassia siamea</i>	}	80
<i>Acacia ferruginea</i>		
<i>Erythroxylon monogynum</i>	}	75
<i>Murraya kænigii</i>		
<i>Syzygium jambolanum</i>		
<i>Zizyphus jujuba</i>	}	60
<i>Bambusa arundinacea</i>		
<i>Jatropha curcas</i> ...	...	50

<i>Murraya exotica</i> ...	...	45
<i>Cassia montana</i> ...	...	30
<i>Terminalia arjuna</i> ...	...	20
<i>Dalbergia latifolia</i>	}	0
<i>Lantana spp.</i>		
<i>Acacia farnesiana</i>		
<i>Albizzia amara</i>		
<i>Melia azedarach</i>		
<i>Mundulea suberosa</i>		

It is interesting to note that sandal does not at all parasitise *Phyllanthus*, *Grevillea*, and *Cedrela*.

In the above locality certain injection experiments are also in progress (since May 1935), with a view to introduce into the sandal plants certain substances that are repellent to insects, and thereby preventing insect attack and build up resistance to diseases. The Chemicals used are Aluminium sulphate, pyridine, strychnine, nicotine, zinc sulphate, manganese chloride.

Excursions with the Research Ranger in N. Salem no doubt related to other subjects of Forestry as well, such as rubber regeneration, eradication of Lantana, regeneration of sandal seedlings under parent trees on prepared ground underneath, with a view to a supply of stumps of known and even age etc.; the rearing of lac and manufacture of lac products. An exhaustive note on lac by Mr. S. Rangasami has already appeared in June and September 1931 numbers of this magazine. A supplement to this, giving results of further research on lac since 1931 will be published in the next number of this Magazine. An important achievement has been the bleaching of lac and manufacture of silk lac, furniture polish etc.



The College is indebted to Rao Sahib Mr. S. Rangasami, and to Mr. M. R. Doraisami Iyer, for their interesting and instructive discourse on various subjects, concluded by light refreshments!

— "*Santalum*."

EXTRACTS.

1. Tropical Forests.

In a session devoted to "Succession of Tropical Forest Types" Dr. Burt Davy dealt with the evolution of tropical African forest types and pointed to the presence of a considerable percentage of Indo-Malayan forms in West Africa though they are no longer to be found in East Africa. He attributed this peculiar distribution to elevation of the land surface, subsequent to migration, with resulting lowering of temperature and desiccation of considerable areas of low country. It was therefore suggested that low-level, broad-leaf tropical rain-forest was at one time more widespread in East Africa than it is now. The presence of a small but significant palæoarctic element extending from Abyssinia as far south as temperate South Africa indicates relatively modern immigration along the temperate zone corridor formed by the high eastern mountain chain.

The distribution of forest types in Nyasaland was briefly described by Mr. P. Topham. The range of elevation within the region extends from 200 ft. to 10,000 ft. and at least nine groups of forest types are to be noted. The biotic factors of greatest importance in relation to distribution are local history, bush fires, cultural methods, fallow periods, grazing and soil rejuvenation by termites. In the absence of longterm fire protection experiments and of fuller local records, the ecological succession of the different types is largely speculative.

The distribution of various Nigerian forest types in relation to temperature, rainfall and elevation was described by Mr. W. D. MacGregor, and particular stress was laid on the succession from the open parkland to the moist deciduous type of forest. Experiments have shown that over considerable areas such a succession takes place with fair rapidity provided there is a nucleus of deciduous forest sufficiently near to supply an abundance of wind-borne seed and provided the area is protected from farming and, in its earlier phases, from grass fires. The importance of enlarging the area of deciduous forest as a check to advancing desiccation from the Sahara was emphasised.

Mr. P. Richards gave a comparative account of three areas of tropical rain forest situated in British Guiana, Sarawak and Nigeria respectively. Each area was studied intensively rather than extensively, and the data were collected so far as possible in a quantitative form. The structure was studied by means of

profile diagrams based on measurements of all the trees on clear-felled plots, and the floristic composition was at the same time determined. The structure is fairly similar in all three localities. An interesting point is the close analogy of the forests on white sand in Sarawak and British Guiana, suggesting that there may be parallel edaphic variations from the climax in different regions of the tropics.

An ecological investigation of peculiar interest was described by Mr. C. G. Trepnell in relation to the application of ecological methods to the study of native agriculture in Northern Rhodesia. Various native tribes have discovered — some more exactly than others — the association of certain wild plants with soils of a certain type and are able to fix on the location and decide on the nature of their cultivated crops in accordance with such observations. Efforts to advance the prosperity of the country should be directed towards building on the foundations already laid by the native himself, rather than to hazardous introductions or innovations.

— *Nature*, 7—9—1935.

2. Molasses and Nitrogen Fixation in Soil.

In two recent publications, N. R. Dhar and S. K. Mukeriji have shown that when cane sugar is added to sterilised or unsterilised soil and exposed to light and air, there is an appreciable increase in the ammoniacal nitrogen content; with unsterilised soils the ammoniacal nitrogen is nine times greater than that originally present in the soil. With sterilised soil it is about three times as great. The amount of ammonia in presence of light is always greater than in the dark. By the addition of molasses to soil which have been properly aerated, the ammoniacal nitrogen may become three times as great as that originally present in the soil. When the aeration of the soil is less, the increase of ammonia is less and the soil becomes acidic. It appears that in tropical countries in ordinary soils, the fixation of atmospheric nitrogen by the addition of energy-rich compounds is partly bacterial and partly photochemical. The oxidation of the energy-rich organic compounds by air either by chemical induction, light absorption or bacterial action causes the fixation of the atmospheric nitrogen in the soil. These researches may be of considerable practical importance, because the molasses available in the sugar factories in India are wasted at the present time.

— *Nature*, 7—9—1935.

3. Madras Fisheries.

The administration report for the year 1933—34 of the Madras Fisheries Department, shows that the outstanding event of the year, which has brought back some measure of prosperity to the fishing industry of the west coast, was the return of the oil sardine in unexpected abundance after an absence almost complete for an unusually long series of years. The oil sardine (*Sardinella longiceps*) is the most important economic fish of the west coast, and its absence had reduced the fishermen to extreme poverty. Its return was just in time to save the industry from extinction, though advantage could not be taken of the fish owing to the prevailing economic depression. Samples were examined twice a week and studied in detail. Research in all directions is progressing, an important result being the success obtained in keeping live pearl oysters under artificial conditions at the Krusadai Biological Station. This points to the possibility of establishing an oyster park which is one of the principal aims of this station. Oysterlings of 30–40 mm. have lived in cages well over a year, during which several have grown to almost adult size (50–65 mm.). There is evidence of the larger oysters in the cages having spawned in captivity. Spawn has been found in the cages, and a pycnogonid found swarming in them had young microscopic oyster spat attached to the lateral processes. Special attention is being given to determination of age and rate of growth. Other investigations are in progress including a systematic survey of deep-sea fishing grounds by the trawler plankton investigations, fish eggs and larvae, daily collection of food fishes and hydrographical records, whilst technological research is not neglected.

— *Nature*, 7—9—1935.

4. Preservation of Game Animals of the British Empire.

Since the conditions in Northern Rhodesia are fairly representative of conditions in many countries in process of colonisation, the report "On the preservation of the fauna of the country" carries implications of more than local significance. The most general of these is that game, on the whole, has shown a marked decrease in recent years, and that this decrease is progressive, in spite of the fact that a few species have, during the same period, increased enormously in number. Natural agencies, as well as man, have contributed to the decrease. Capt. Pitman attributes it, in the first place, to the great rinderpest epidemic of thirty to forty years ago, which

over vast areas wiped out the ungulates, particularly buffalo, eland, lechwe, waterbuck, bushbuck, pig and warthog. Before the stock had time wholly to recover, the Great War came along, and slaughter for the food of the forces again reduced it "practically to vanishing point" in certain of the provinces. From this disaster most of the species have never recovered, and in their reduced numbers incessant harrying by natives armed with muzzle-loading guns (of which nearly 25,000 have been registered by natives) has caused a progressive decline, and in many localities has brought species to that paucity of numbers which is the forerunner of extinction. Finally, the coming of the railway and the development of mining areas have led to the death of several hundred thousand herd at the hands of Europeans.

The general result is that from districts here and there in which they were once common, species are disappearing: where Broken Hill now stands was once one of the best hunting grounds for the greater kudu, the rhinoceros is all but gone from North-Eastern Rhodesia, the blue wildebeest has vanished from the Awemba district, the lechwe from Kawanbwa, game generally from the Fort Rosebery District. * * *

Nature 19-10-35.

5. The Forestry Commission.

The funds at the disposal of the Commissioners are being deposited in a safe bank. If we look at the question from the point of view that it is not the forester but Nature which produces the timber, we get a clearer idea of the economic basis of forestry. The forester by his labour and a certain amount of capital outlay in material produces conditions which enable Nature to become his ally in the direction he desires. Once he has placed the right tree in the right environment, natural growth factors such as sunlight and temperature, with a suitable amount of air and soil moisture, enable the living machine to get to work and from the carbon dioxide of the air and a small amount of mineral food materials from the soil, timber, which consists mainly of carbon, is produced. The raw material is cheap and abundant. The carbon from the air costs nothing and the small quantity of minerals from the otherwise idle soil is being put to a useful purpose, and as time goes on the productive capacity of the soil is improved, under suitable sylvicultural management. Surely then, something for nothing, with raw material inexhaustible, if properly used, is

an attractive proposition. The forest capital is increasing in direct ratio to the rate of growth of the trees. The forester organises the industry in which Nature supplies the driving power and the raw material. The trees are his 'workmen', which if properly treated are busy night and day with no 'off' time or unemployment. There are therefore, surely, a few concerns in which money, especially national funds, can be applied with more safety or greater mutual benefit to all.

Fifteenth Annual Report of the Forestry Commissioners for the year ending 1934, London.

6. Flying Fishes.

During a voyage down the west coast of Africa, I have been watching the flying fishes, moved partly by vague recollections of the contradictory opinions that have been published regarding their flight. Without the literature I cannot make specific reference to the controversies, but a brief summary of of what seem to me the most obvious facts about the 'flight' of flying fishes may be of interest.

(1) The motive power is the same in the air as in the sea: it is that of the tail-shaft musculature exerted through the tail against the water.

(2) The flight is usually started by a swift rush at a low angle up to and through the surface. But if this fails, for example, through jostling in a crowd, the fish is easily able to make a 'standing start' from the surface itself; a quivering vibration of the tail launches it almost instantaneously into full flight.

(3) The same manoeuvre is regularly used to prolong the flight. At the end of the initial skim the fish often abruptly dives, but almost as often it dips the lower blade of the tail into the water instead and drives itself on for another stage. This may be repeated up to five or six times. It is perhaps the easiest thing to observe about the actions of a flying fish, and it is a never-failing surprise to see how short is the duration of of the quivering dip and what a vigorous fresh impulse is derived from it.

(4) There is never the slightest sign of any impulse being derived from any other source. The fins during the flight are stiffly spread; they are used with great skill as planes, but never as wings.

(5) The flight is not a blind rush: while its way lasts, the fish can steer and turn up and down the waves and along them as gracefully as a petrel.

(6) The usual end of a flight is a sudden dive with shut 'wings'. But sometimes the dive is preceded by a sailing action with slightly up-tilted body and planes, like a seagull gliding to rest on the sea—one of the prettiest things a flying fish does.

(7) The flight is made at all angles to the wind, and in any wind from a calm to half a gale. Naturally the most difficult direction is down-wind, because the fish must push off at a considerably greater speed than that of the wind in order to rise at all. For the same reason a down-wind flight is made in a noticeably tilted-up position; it is in the nature of a prolonged sailing to rest.

(8) It is probably true that the fishes fly more freely in sunshine than in dull weather, but they do fly under an overcast sky as successfully as in sunshine. They are also known to fly at night, especially when they are disturbed by artificial light.

A good deal of unnecessary mystery seems to have been made about the flying fish's flight. The real mystery is the acquisition, by this one small group, of a fin and tail structure adapted to 'flight' and a singular adroitness in using it.

Nature 21-9-25.

7. Colour Changes in the Eye of a Grasshopper.

In 1916, Prof. Okazaki noticed that the eyes of a long-horned grasshopper (*Hexacentrus japonicus*) were jet black when he collected the insects one evening, but on the following day were golden yellow. Several other insects show a similar change, and Hajime Uchida has studied the changes in another long-horned grasshopper, *Homorocoryphus lineosus*. Surrounding the cone of each ommatidium are two principal pigment cells which change their position according to the intensity of the light. They contain black granules. Accessory pigment cells occupy the interspaces between ommatidia, and contain yellowish reflecting pigment granules. When the eye is exposed to light, the principal pigment cells and the granules within them retreat proximally, so that the apparent colour is due to the accessory cells. In the dark-adapted eye the principal cells entirely encircle the cone, pushing aside the accessory cells. When light-adapted insects are transferred to a dark room, the distal migration of pigment granules takes place very rapidly during the first twenty minutes, and thereafter slows down, so that the full dark-adapted condition is attained only after fifty minutes. In the reverse process, the rate of retreat of the black pigment granules in the principal pigment cells is proportional to the intensity of the light.

Forests and Forestry.

By, P. W. Davis, I. F. S.

We publish hereunder the lecture delivered by P. W. Davis Esqr., I. F. S., Principal, Madras Forest College, at the Government College Coimbatore, in November 1935, the object of which was to enlighten the public on the utility of forests, and the aims of the Department. We feel sure that many of our readers will find in it a good deal of information of interest and value. — Ed.

"I welcome this opportunity of addressing this meeting this evening. When my friend Mr. Duraiswamy Aiyar first approached me upon this matter, I told him that my first temptation was to flee the ordeal of a public platform, but I realised that I could hardly continue to urge with any degree of conviction upon students of the Forest College, who will shortly become Forest Range Officers, the necessity for educating the public upon Forestry matters if I neglected the opportunity myself. And after thinking it over, I am very glad that I accepted. For, times are changing. In the past the Forest Officer has been content to go about his job knowing that he was serving the community and that he was supported by Government. Under the new Constitution, Forest Policy will probably require to be justified before critical legislatures whose members will have to take the responsibility of supporting or acquiescing in measures which will sometimes be distasteful to their constituents in the country. The plea for the disreservation of forest areas will not be diminished by the increasing pressure of the population on the one hand, nor by the increasing number of so-called "wood substitutes" for various purposes on the other. Even at present it is probably true to say that the Forest Department in India is the least popular of the Government Departments. In the Councils it is stigmatised as top-heavy and over-staffed, and by the cultivators in the countryside it is regarded as a wholly unnecessary scourge. Neither the educated classes nor the general public are—to use a modernism—"forestry-minded"; in other words, the role of forests in the economy of man is inadequately realised by the majority of people. This is not altogether suprising. In the eyes of civilised man, and more especially the townsman, the forest represents an uncomfortable primitive state of nature

which he has managed to escape from. "Nature in the Raw", however thrilling it might appear in the comfort of the cinema, somehow loses its attractiveness at first hand. Most people if they enter the jungle, stick to well-worn tracks, and are quickly dismayed if by chance they find themselves surrounded by an unheeding tangle of vegetation with a risk of losing their bearings. And such a predicament is certainly unpleasant. But except for shikar—a form of amusement out of the question for most—there is little disposition to turn to the forests for recreation. Apart from this, let me attempt to summarise the reasons for the general lack of appreciation for the work of the Forest Dept. *First*, the Department has to manage the forest in the general interest of the public, and not for individuals or for small local communities; therefore the local villager is apt to regard the safeguards imposed by authority as an unnecessary restriction upon himself. *Secondly*, forest areas are situated on difficult country, so that the work that goes on there is not evident to the general public. *Thirdly*, the practical results of forest work are generally evident only after a long time, which may be a generation or more in the life of human beings. *Fourthly*, there is a very general lack of appreciation of the fact that this Department is concerned not only with the present generation, but with posterity. This is one reason why forestry cannot be left to private enterprise, but is essentially a concern of Government which can afford to be long-sighted. *Fifthly*, in localities where the area of forest is proportionately small when compared with the needs of the people, the interests of the people and of the Department are bound to clash. The rights of the State must appear very academic and largely meaningless to a man who with difficulty manages to keep body and soul together. You will sympathise with the poor man, and not only you, but the elected representative of the people of that District will sympathise with him too. What is generally forgotten in the sympathy is that there are large tracts of country where all trace of forest has long since disappeared and the ryots have to do without the conveniences afforded by a forest in their vicinity. If you allow the destruction of the forest to continue, other tracts of country will also very soon be reduced to the same condition and the ryots will not then complain! The forest exists as a grievance only so long as Government attempts to prevent its destruction and to regulate the utilisation of its produce so that not only the present generation will get the benefit but its sons and daughters too. It should be axiomatic that Government should not seek to derive a great profit from such village forests, and indeed it does not do so. As you know, many such forests have been handed over to village panchayats

to manage—and it is to be feared that in many cases the transfer has not been to the benefit of the forests! Then again, a poor man who has lost his house, say in a fire or by flood or by other causes beyond his control, may get a free grant of timber, bamboo or thatch to rebuild it. The value of free grants and material extracted from the forests by right-holders in this Presidency amounted in 1933-34 to Rs. 85,232/-. If there are no forests in the neighbourhood, a man has to pay dearly for timber, bamboos and fuel, his cattle are poorly fed, and he has to utilise the cattle dung for fuel instead of for manuring his fields. Let us look at the question from another point of view. The last census returns in 1931 gave for the Madras Presidency an average population of 332 per sq. mile. Statistics of fuel consumption show that an average family of five people requires from 5 to 13 lbs. of firewood per day; these figures were obtained in towns where as a rule rigid economy in fuel consumption is necessary, and this refers only to fuel used for cooking purposes. But we will suppose that an average figure is 8 lbs. per day. This works out to an annual demand of 86.6 tons for 332 people. The annual yield of an acre of forest land depends very much upon conditions of soil and climate. The dry scrub jungles of the plains will yield only about 1/5th of a ton per acre per annum, whereas the bluegum plantations of the Nilgiris yield as much as 10 tons per acre per annum. The average fuel forest may be said to give about 1/2 ton per acre per annum. So that in order to supply the needs of 332 people twice 86.6 or 173 acres must be put aside for every square mile for the production of domestic fuel. This amounts to 27 per cent of the land surface—over one quarter, whereas the proportion of forests to the whole area of the Madras Presidency amounts to only 11.4 per cent. Even in such a heavily industrialised country as Belgium, where the population in 1925 was 655 per sq. mile, the ratio of forest to total land area is 18.2 per cent—that is 20 acres per 100 inhabitants; in Germany with a population of 300 per sq. mile in the country (apart from the cities) it is 23.8 per cent, or 50 acres per 100 inhabitants; in France, the ratio is 18.4 per cent, or 60 acres per 100 inhabitants. So that you see, Madras Presidency has not got too much forest as judged by comparison with even the most industrialised countries in the world, with the exception of Gt. Britain. In fact it might astonish you to know that out of a count of 114 separate countries in the world, only 17 have a smaller ratio of forested country, and 97 have a larger and generally a much larger ratio, than Madras. The ratio for all India (including Burma, which is itself about two thirds) is 23.8 per cent, which is about an average for the world. As regards the world production and

consumption of wood, it is important to realise that wood is still the basis of modern civilisation; you are sheltered by it, you sit on it, work on it, sleep on it, eat off it, read from it, write on it, and are becoming increasingly clothed by it—you may even before long be eating synthetic wood products. This is the age of iron, steel, coal, steam and electricity, and one might add, of chemistry. The world production of wood amounts to about 56 billion cu. ft. which is an average of 32 cu. ft. *per capita* or a cut of $7\frac{1}{2}$ c. ft. per acre of forest. Over half of it, 30 billion c. ft. is cut for firewood, and 26 billion c. ft. is saw-timber. On the other hand, the total quantity of wood grown in the world is estimated at only 38 billion c. ft. a year. Although this figure may be an under-estimate, it is clear that the annual growth is not replacing the annual cut of 56 billion c. ft. It is probable that some time yet in the future, the tropical hardwoods will occupy an increasing place in the world's markets, but for many reasons, which I shall touch upon later when dealing with the present situation in India, the crux of the world's timber supply problem will rest in the available supplies of conifers and temperate hardwood forests, for the next generation or two at least.

I have time barely to mention here the various important bye-products of the forests, such as fruits, gums, oils, dyes, tannins, and drugs, of which the total value is very high.

Now having established the real need of forests in supplying the basic requirements of human society, I must tell you something of their indirect value for the well-being and happiness of mankind, and of the kind of problem which every country finds itself up against at some time or other in its history. It is unfortunate that these indirect-economic, cultural and biological aspects of forests usually find no place in public education, although they are matters of national importance. Of the cultural significance of forests I have hardly time to dwell. The poet and philosopher Tagore has described at some length the part played by Indian forests in the development of Hindu civilisation and philosophy in his book "The Realisation of Life". The great anthropologist, Sir James Frazer in his classic work "The Golden Bough" comments frequently upon the role of trees in ancient cults and folklore, a common heritage in one form or another with most of the races of mankind. This is but natural, for primitive man grew out of and was largely dominated by the forests; but in time he learnt to dominate them. When civilisation emerged, it was not in primeval forests but in lands of comparatively scant forest and considerable pastureland. Since then the pressure of growing populations

has caused the ever continued pushing back of the forests of the globe and the process is still going on, perhaps faster than ever. On the edges of forest land, the customary primitive method of agriculture, as you know, is to cut down the vegetation, burn the debris which adds ash to a soil already rich in organic matter raise crops for a season or two and then repeat the same process elsewhere. This method of travelling cultivation, known hereabouts as "ponam" is extremely wasteful, and it eventually means ruination. Government in Madras early recognised this fact, and prohibited it in waste-lands about 1860. Parenthetically, I may here remark that the Forest Department now permits jungle tribes to employ their traditional methods in Government forests under proper supervision, and along with the cereal crops of paddy or gram are planted tree seedlings of good species, so that the original forest is in time replaced by one of greater economic value than before. Now let me quote you an example of what happens without proper control of such cultivation. I refer to the Nileshwar Magane of Kasaragod Taluk in S. Kanara. This being formerly a part of the old Nair kingdom, where an inherited right to the farming of waste-lands was in vogue, it was exempted by Government from the restrictions placed elsewhere last century. These wastelands, mark you, were farmed by resident landowners, not by wandering tribes, and so it might have been reasonably expected that these landowners knew how to preserve their own interests. In 1894, the Special Settlement Officer, Malabar and S. Kanara reported as follows:—"In these villages I saw hundreds, nay thousands, of acres of the most dismal waste lands. The surface soil had been washed away and the land consisted of sheets of laterite rock with a few tufts of coarse grass and some miserable shrubs. The village officers admitted that this had been formerly *warg-kumri* (meaning property under ponam cultivation) and that kumri cultivation had reduced it to this present condition." Anyone with experience of West Coast soils knows that once they are exposed to weathering influence, they quickly become converted to laterite rock, which is truly the last word in barrenness. But the words "The surface soil has been washed away" — these ought to be sung as a dirge, for they mean that the land is committed to an abomination of desolation. It must have been the swan-song of those lands spread across the globe which once supported vigorous and prosperous communities, the ruins of whose civilisations the archeologist is now busy picking out from the dust and debris of their own reckless mismanagement; lands such as those in northern China, Asia minor, Greece, Spain, North Africa — desert country where the trees and shrubs have disappeared until the earth

is turned into a saline wilderness. It has been stated that the ancient Maya civilisation of Central America had to migrate because it became choked up with mud washed down from its own cornfields on the hill-sides. First the fine topsoil is washed down, then the fine sand and gravel: gullies are quickly formed, and then with ever-increasing rapidity are brought down soil, stones and rocks as well on the fields below. Then follow floods in the wet season, drought in the dry season, wells dry up, irrigation works silt up, cattle die, people migrate. That is the order and logic of the process, once the natural vegetation of a region is destroyed. Don't think this is confined to hot regions. North China is temperate but largely desolate, and we've all heard about Chinese floods. Let us take France: by the middle of the seventeenth century her forests were being subject to such devastation that one far-sighted statesman recognised that the existence of the nation was being imperilled by their destruction, and he gave expression to a phrase often quoted since — 'La France perira faute des Bois' — France will perish through lack of woods.

Let us take another temperate country — one of the richest in the world — the United States of America, and see what has been happening there. As you know during the last century and the pre-war years of this century, the surplus populations of Europe migrated there and opened up the wilderness by leaps and bounds at a pace unequalled elsewhere in history.

The settler had never heard of conservation; he wanted every acre of good farm-land that he could lay his hand upon to put under the plough. And these were soils of magnificent texture and fertility, legitimately applied, one might think to the purpose of agriculture. They had been protected through thousands of years by mantles of climax vegetation in perfect natural equilibrium, representing conditions of maximum absorption of rainfall and maximum erosion control. By the removal of that vegetation these soils were therefore suddenly exposed to the force of torrential rains at one season of the year and to fierce desiccating winds at another season, and subjected to erosional processes of quite a new order, with the result that topsoils have been washed away or blown away leaving exposed a raw intractable subsoil, permanently impoverished and often unsuited for agriculture. It has been estimated upon the basis of recent soil erosion surveys that the utility of 51 millions of acres of once good farmland has been destroyed largely by gully erosion.

From another 125 millions of acres, still mostly under cultivation, the topsoil has been washed off by surface drainage. The annual loss to the country is estimated to be in the neighbourhood of \$ 400 000.000, or approximately Rs. 1,200 millions. Nor is the farmer the only one concerned, for many large public works have been ruined. Out of 13 power dams in the southern states, 11 have had to be abandoned because they have filled up with silt. The dam across the Colorado river at Austin, Texas, filled up with mud to 35 % of its capacity in 20 years. I want to be clear that I am not referring solely to the result of an absence of forest conservancy, but to the wholesale removal of natural vegetation, whether forest or grass, the breaking up of virgin soil with the plough, and the trampling and destruction of forage herbage, by the large herds of cattle. Let me now give you some actual figures derived experimentally from control plots. Increasing the vegetation from 16 to 40 per cent of complete cover, and the replacement of certain species by others having a more extensive and fibrous root system *reduced* surface run-off by 64 per cent, and rainfall erosion by 54 per cent. Experiments made in California by Lowdermilk showed that surficial run-off from burnt and bare surfaces exceeded that from litter-covered surfaces by 3 to 30-fold, and erosion was greater by 50 to 6,000-fold, and that forest litter continued to function in this respect far beyond its point of complete saturation under an artificial monsoon of 80 ins. of rainfall in 23 days. It is on hilly country where forests come in as conservers of water for stream-flow and to increase underground seepage, and this they do better than any other vegetable cover. By breaking the violence of rains, and by increasing the absorptive capacity of the soil, they reduce the urgency and volume of surface run-off to no more than obtains in level country. I must mention that there is now a Soil Erosion Service in America, formed with the object of arresting destructive processes and of educating farmers up to facts. One farmer is reported to have told an interviewer: "Me and my old dad have wore out three good farms between us, and I guess there ain't nobody can tell us what to do about it." That is the attitude of many farmers.

The necessity for educative propaganda is not confined to any one country. But past lessons are now having their effect; in practically all counties of the civilised world has been born a new and better appreciation of the value of forests, a broader outlook in associating forests with improved farming and grazing conditions and the amenities of the countryside. In the United States the Federal Government is sponsoring the new

great Shelterbelt Project throughout the farms of the great region from Montana and North Dakota in the north, to Texas in the south, and has voted a million dollars for it during the current year. In Italy during last year alone 12, 774 hectares (31, 350 acres) of denuded land were reforested, 386,000 c. metres (13,626 000 c. ft) of retaining walls were built to restrict the erosive force of mountain torrents and prevent landslips, and 1078 kilometres (669 miles) of forest roads were built; improvements to mountain pastures have been started and national recreation parks have been formed, which you will agree is no mean effort.

I ought not to omit to mention the important hydrological role of forests in level country. Their importance has long been recognised as an effective means of draining and drying up swamp-land, the breeding places of mosquitos which carry malaria. The dune areas lying between the Gironde and Adour rivers of the Landes district in France provide an impressive spectacle of the improvements brought about by fixing the moving sand-dunes and reforesting the tract with Maritime Pine, of which the French Forestry Dept. is justly proud. A hundred years ago this strip of land, 3 to 4 miles wide and 150 miles in length was little better than a fever-stricken waste supporting a sparse and poverty stricken population which lived by sheep grazing. Today it has become a rich and prosperous region, giving protection to agriculture and to numerous industries connected with the forest, while to visitors it has become a famous health-resort. The reclamation of the Pontine marshes near Rome is another illustration in point. Conversely, the clear-felling of extensive areas of forest in level country tends to a raising of the water-table and swampy conditions. Those who object to any forest in the plains where rainfall is considerable would do well to remember this fact.

I have talked at some length upon the lessons and experiences of other countries, because it may be taken for granted that if forests and natural vegetation exercise such an important role in temperate regions, that role cannot but be enhanced in tropical countries such as India, where the forces of nature work more quickly. The natural vegetation must be preserved at all costs in the places where it matters most, even if it does not bring in a rupee to the coffers of the State. Now in actual fact the forests of India are a very valuable property which brings in a direct revenue of crores of rupees. In the year 1932-33 in spite of the unusual depression the net surplus revenue was Rs. 84,14,408/-. Yet in spite of this fact, India

is a timber-importing country and the saturation point for timber is further removed in India than in any other country in the world. Let us consider the economic position of our Indian forests.

The fact is that in spite of her 100,140 sq. miles of reserved and protected forests, India *imports* about half as much as she produces. The value of Teak alone, imported mostly from Burma, amounted to an aggregate of 229 thousand tons in the three years 1928-30. In addition to this, the post-war average of imported manufactured timber in the shape of furniture, etc. is in the neighbourhood of Rs. 50 lakhs a year and India spends upon paper and allied materials about 3½ crores of rupees annually. These figures should go far to reassure us that demand for timber must go on increasing in the future, despite the many substitutes for wood now coming upon the market. You might ask why the Forest Department cannot supply more timber for the home market when there appears to be so much of it. I hope to have time to explain that in more detail later. Large timber merchants and importers are notoriously conservative and are not readily induced to change their habits all at once even were we able to deliver the goods. Then again I must remind you a little of the history of Forest Administration in India and of the difficulties which beset the protagonists of forest conservancy. A separate forest administration only came into existence in India in a small way in 1856. The first milestone in progress was the promulgation of an Act called the "India Forest Act VII of 1865" which was designed to give protection to the forests as a whole and officers of the Department authority to carry out their necessary work. However, the Madras Government refused to have this Act applied to the Province, stating that the Penal Code already provided for every contingency likely to arise. In 1878, a new act was brought into force which remedied certain defects in the old act of 1865, and was extended to all provinces in India with the exception again of Madras and Coorg. The state of affairs in Madras was brought pointedly to the notice of authorities by the then Inspector - General of Forests, Sir Dietrich Brandis, in a memorandum in that year pointing out that there had been a tendency on the part of the Government of Madras to give up all rights of the State to the forests, or at least to do very little about them. While other provinces had gone ahead in the demarcation and separation of lands to be permanently maintained as forest, no adequate progress had been made in this Presidency. At long last, and due to Sir Dietrich's efforts, the Madras Forest Act was passed into law in 1882. I mention all

this for a reason, and that is to point out that the supersensitiveness displayed by the Board of Revenue and the Government time after time over a period of no less than 80 years of British rule upon the question of the rights of property — leading as it did to the serious detriment of forest and waste lands — nevertheless furnishes a very complete answer in itself to the charge that Government have been unsympathetic towards the legitimate interests of the ryot. But the result was that when the charter of the forests was eventually conceded, and forest settlement proceeded in earnest, the Department entered upon what was largely a bare and depleted heritage, which nothing short of a century of conservation and scientific management could put right. The whole work of the Forest Department up to the beginnings of the present century in this province was taken up with forest settlement, with regulating the activities of timber merchants, organising an efficient protective staff and with building up the foundations of sound forest administration. There is one pleasing exception to record, and that is the instance of the Nilambur Teak plantations. These forests were started by an enlightened Collector named Connolly in 1840, and a large area was gradually acquired by lease and purchase by the Government, and these now world-famous plantations were planted up in the Nilambur Valley and surrounding country. By 1918—19 these forests had yielded a net financial return of 6.9 per cent interest upon all the money invested in them. But these as I say, are an exception. In the rest of the important timber-bearing areas in the Presidency, the trees are still mostly young or immature and will not reach an economic size for cutting for a considerable time to come. In the meantime, we have to harvest what merchantable timber we can find in the natural forest, and this unfortunately is often in difficult and remote country. You'd be surprised for instance at some of the places the humble railway sleepers come down from. Another difficulty about our natural forests is that they are such a mixed lot. There's an enormous variety of species intimately mixed up together, of which at present only a sadly small proportion are merchantable at a profit — and of course the more remote the locality, the fewer the species worth cutting, for the cost of extraction is so heavy. Then again, timber exporting countries are generally able to utilise their rivers for floating, but only a few of India's rivers are adaptable for rafting logs down to the coast or to sale depots, so that road transport, which is much more expensive, must be used instead. In world markets outside India, there is a demand for a few of the cabinet woods but in limited quantities and for high grades only, and it is hard to satisfy these exacting specifications from forests which have

suffered in the past from fire, misuse and neglect. So now perhaps you will better understand my earlier statement that the bulk of the world's timber supply must continue to come from the temperate forests for some time hence, which in European countries at least are under very intensive management.

I have stated somewhat crudely, the difficulties which in the past have been met and surmounted, and of the present difficulties which are largely of a physical nature. But I don't want you to infer from this that forestry itself is a crude and amateurish business. Conditions in India force us to undertake in many places types of felling which are admittedly no more than a provisional makeshift, there being no other method of utilising the mature produce in these vast irregular forests with which we have to deal. But forestry is more than just cutting trees; it is a science and also an art of no mean order. It is the cultural and management aspects of forestry which are by far the most absorbing, and give to forestry its peculiar fascination. I can only just find time to touch upon its principal characteristics now. In the first place, forestry is almost unique among man's several activities to exploit the natural products of the earth, because forests are *living* products of the soil and so unlike mines, they can under proper management, be *renewed* and made to yield for perpetuity. In this sense, forest crops are of course not unlike agricultural crops. But there are certain differences. Forest crops are wild plants, scarcely modified by cultivation. Then they are long-lived crops, not harvested annually, but only after long periods of time. In agriculture it is essential to till the soil, to manure it, irrigate it, drain it, and so on. These operations are necessary in forests too but over very large areas, and using only the resources which Nature herself uses. Tilling the soil is done by the tree roots and by the soil fauna, which burrow and push aside the soil; fertilising the soil is done by the fallen foliage which is resolved into humus; draining the soil is done by transpiration from the crowns of the trees, and so on. The relation between soil and forest cover is therefore much closer than is the case with agricultural crops. The forester's methods therefore boil down to a judicious manipulation of all the natural implements at his command which affect forest growth, especially that of canopy. The *science* of forestry consists in recognising that forest vegetation is not just an aggregation of trees and other plants brought together by chance, but a community which has arisen and developed according to definite biological laws as precisely

operative if not yet so fully summarised as other natural laws. The *art* of forestry consists largely in the forester's skill in estimating the sum of the various interacting forces upon any one spot, and thus utilising them to the best advantage. Forestry for this reason might be defined as applied ecology. In nature, the least change in topography, exposure, depth of soil, climate, etc. means a corresponding change in the character and composition of the resulting vegetation, its density, rate of growth, height and other things. It has also to be remembered that directly man enters and interferes with the natural forest he creates artificial conditions, and Nature has a habit of protesting sternly, if she is too flagrantly outraged.

It is a commonplace no doubt that it is one thing to exploit a forest and another thing altogether to replace it by as good or a better forest, and with crops *arranged in a certain order*. This however, is one of the forester's main preoccupations. Two main principles underlie good forest practice. They are, first, the principle known as that of the *sustained yield*; second, the principle that the harvesting of the produce and its renewal must be practically identical or parallel operations. The first principle is dealt with under the subject of 'Forest management'. Briefly it means that if you have a crop which is to be harvested at say 70 years old, you must have only one-seventieth of the total area of forest under crops of 70 years, a similar fraction under crops of 69 years old, another seventieth under crops of 68 years old, and so on in a complete series of age classes from 1 upwards. It does not of course matter whether these age-classes are separated out on the ground or whether they are all mixed up together throughout the forest, so long as they are there. By this means you will have not only a constant yield year by year for ever, but you are sure that you are harvesting only the annual increment upon the whole forest, which corresponds to the interest upon your capital — in this case your growing-stock. You will not be eating into your capital, nor will you be letting it accumulate unproductively. This state of affairs is the ideal aimed at in all scientific forest management. This will explain why a comparatively small portion of your forest can supply the market requirements at any one time, and the rest of it is growing up. Then, in order to renew the old crop, according to the second principle, there are a considerable number silvicultural systems in vogue, which regulate the type of felling, and the character of the forest itself according to the species grown, the soil, the topography of the country, and the general requirements of management. These general systems have reached a very beautiful degree of perfection in many European

forests, although out here they have sometimes to be adapted or modified. In order to secure continuity of working, to regulate the cut, to secure an orderly and convenient arrangement of areas for felling, to lay down silvicultural rules to be followed in the regeneration, tending and harvesting of crops, a "Working Plan" has to be formulated for each tract of forest to be worked for a given class of produce. This is the stage to which we have got now in the management of the Government forests, and it has meant a great deal of assessing, stockmapping and valuation of the forests of the Presidency. At present out of a total forest area of 15,652 sq. miles, 6,800 sq. miles are now under sanctioned working plans, 1,332 sq. miles under preparation.

Although I should like to say something about research and present-day tendencies in forestry, I feel sure that I have approached the limits of endurance of my listeners, and I must not encroach further upon time. In conclusion I wish merely to say that Indian Forestry has grown out of its apprenticeship; it stands on its own feet in forestry counsels, it is the "elder brother" of tropical and colonial forestry and it has a record of achievements of which India may be proud. Let us hope that what has been done in the past may bear fruit in the course of the future.

Notifications Relating to Rangers.

2-12-35. The following promotions of Rangers are ordered :—

With effect from 3-8-1935, vice, Ranger K. P. Benjamin, First Grade, dismissed from service :—

1. Mr. A. Ranganayakulu, from Second grade, permanent to First grade (temporary). 2. Mr. H. Thammayya, from Third grade, permanent to Second grade (temporary). 3. Mr. A. K. Kunjuni Nayar, from Fourth grade, permanent to Third grade (temporary). 4. Mr. M. P. Subbayya, from Fourth grade S. P. T. to Fourth grade (temporary). 5. Mr. M. Narasinga Rao Nayudu, from Fifth grade, permanent to Fourth grade S. P. T. 6. P. V. Krishna Rao Nayudu, from Fifth grade, S. P. T. to Fifth grade (temporary). 7. A. Vyasalu, from Sixth grade, permanent to Fifth grade S. P. T. 8. Mr. T. M. Krishnamacharya from Sixth grade, S. P. T. to Sixth grade (temporary). 9. Mr. R. Thangavelu Pillai, from Seventh grade permanent to Sixth grade S. P. T. 10. Mr. D. V. Nagarathnam, from Seventh grade S. P. T. to Seventh grade (temporary). 11. Mr. B. Venkata Rao, temporary Ranger, to Seventh grade S. P. T. 12. Mr. Gulab Sing, Trained Forester, to temporary Ranger Seventh grade.

II.

With effect from 3-8-1935, vice Ranger T. K. Ramaswami Ayyar, First grade retired :—

1. Mr. A. K. Kandam, from Second grade permanent to First grade (temporary). 2. Mr. T. G. Sankaran Nayar, from Third grade permanent to Second (temporary). 3. Mr. K. Sankaranarayana Rao from Fourth grade, permanent to Third grade (temporary). 4. Mr. N. Narasinga Rao Nayudu from Fourth grade, S. P. T. to Fourth grade (temporary). 5. C. Vasu, from Fifth grade, permanent to Fourth grade S. P. T. 6. Mr. A. Vyasalu, from Fifth grade, S. P. T. to Fifth grade (temporary). 7. S. V. Nagalingam Pillai from Sixth grade, permanent to Fifth grade S. P. T. 8. Mr. R. Thangavelu Pillai, from Sixth grade S. P. T. to Sixth grade (temporary). 9. Mr. P. K. Subbanarayana Ayyar, from Seventh grade, permanent to Sixth grade S. P. T. 10. Mr. B. Venkat Rao from Seventh S. P. T. to Seventh grade (temporary). 11. Mr. V. Rangachari, temporary Ranger, to Seventh grade S. P. T. 12. Mr. M. B. Kalappa, Trained Forester, to temporary Ranger, Seventh grade.

III.

With effect from 1-11-1935, vice Ranger S. M. Srinivasagam Pillai, Fourth grade, retired from service :—

1. Mr. C. Vasu, Fourth grade, S. P. T. to Fourth grade (temporary). 2. Mr. T. Kondathukavundan, from Fifth grade, permanent

to Fourth grade S. P. T. 3. Mr. S. V. Nagalingam Pillai, from Fifth grade, S. P. T. to Fifth grade (temporary). 4. Mr. Abdul Khalak Sheriff, from Sixth grade, permanent to Fifth grade S. P. T. 5. Mr. P. Subbanarayana Ayyar, from Sixth grade S. P. T. to Sixth grade (temporary). 6. Mr. V. Veeraswami Nayudu, from Seventh grade, permanent, to Sixth grade, S. P. T. 7. V. Rangachari from Seventh grade S. P. T. to Seventh grade (temporary). 8. Mr. S. Rangamannar Das, temporary Ranger, to Seventh grade S. P. T. 9. Mr. M. Gopalaswami Nayudu, Trained Forester, to temporary Ranger, Seventh grade.

IV.

With effect from 1-12-1935, vice Ranger A. Rama Hebbar, Second grade, retiring from service :—

1. Mr. S. Sundaravaradacharya, from Third grade, permanent to Second grade (temporary). 2. Mr. S. G. Venkataramanau, from Fourth grade, permanent to Third grade (temporary). 3. Mr. T. Kondathukavundan, from Fourth grade, S. P. T. to Fourth grade (temporary). 4. B. V. Vaideswara Ayyar from Fifth grade, permanent to Fourth grade S. P. T. 5. Mr. Abdul Khalak Sheriff, from Fifth grade S. P. T. to Fifth grade (temporary). 6. Mr. M. S. Krishnaswami Ayyar, from Sixth grade, permanent to Fifth grade S. P. T. 7. Mr. V. Veeraswami Nayudu, from Sixth grade, S. P. T. to Sixth grade, (temporary). 8. Mr. T. N. Vedantaramanujam, from Seventh grade, permanent to Sixth grade S. P. T. 9. Mr. S. Rangamannar Das from Seventh grade S. P. T. to Seventh grade (temporary). 10. Mr. Y. Subrahmanya Nayudu, temporary Ranger to Seventh grade S. P. T.

2. With reference to the orders of Government in G. O. No 818, Public (Services) Department, dated the 22nd May 1935, the permanent vacancies mentioned above have been filled on a temporary basis.

Waltair Circle.

7-11-35. Mr. A. Tirupatirayudu, on expiry of his leave, posted to Pulusumamidi Range, Godavary Upper Division. 2. On relief by No. 1 Mr. T. S. Ratnavelu Mudaliar, posted to Marri-gudem Range. 3. On relief by No. 2, Mr. Ahmed Sheriff M. R. H., Forester Fifth grade, posted to Palnad Range, Guntur Division.

29-11-35. Mr. A. S. Kaunds (M. R. H.) Forester First grade to continue to act as Ranger last grade (New scale) from 26-10-1935, vice Ranger M. A. H. Kirimani Sahib granted extension of leave for 3 months from 19-9-1935. 2. Mr. M. B. Madappa (M. R. H.) Forester First grade to continue to act as Ranger last grade (New scale) from 14-10-1935, vice Ranger J. D. Theodore granted leave for 3 months from 13-9-1935.

- 3—12—35. Mr. P. Chengalreddi, Ranger Sixth grade, posted to Lakkavaram Range, Godavari Upper Division. 2. Mr. C. S. Sivagnanam (M. R. H.) Forester Fifth grade, on relief by No. 1, posted to Ganjam Division to take up verification of Reserved Forest boundaries in Pondakhol, Surada Range, Ganjam District. 3. Mr. J. D. Theodore, Ranger Fifth grade on expiry of his leave on 12-12-1935 posted to Nugur Range, Godavari Upper Division.
- 13—12—35. Mr. Ahmad Sheriff, (M. R. H.) Forester Fifth grade promoted to officiate as Ranger, last grade (New scale) from 5-8-1935 to 30-11-35 *vice*, Ranger A. Tirupatirayudu, granted leave on medical certificate for 6 months and 3 days from 28-5-1935, During this period he was holding charge of a Range.
- 3—1—36. Mr. P. Dhananjaya Rao, to Vinukonda Range, Guntur District.
- 6—1—36. Mr. M. A. H. Kirmani Sahib granted further extension of leave for four months from 19-12-35, in continuation of the extension sanctioned.
- 24—1—36. Mr. P. Dhananjaya Rao, on expiry of his leave will be on special duty in Guntur District. His transfer to Narasapatam is held in abeyance for the present.
- 25—1—36. 1. Mr. A. S. Kaunds, trained forester and officiating Ranger, last grade, to continue to officiate as Ranger last grade from 19-12-35, *vice*, Ranger Mir Abdul Hussain Kirimani Sahib, granted extension of leave for 4 months from 19-12-35. 2. Mr. M. B. Madappa, trained forester and officiating Ranger, last grade, to continue to officiate as Ranger, last grade from 12-12-1935, *vice*, Ranger P. Dhananjaya Rao on leave from 20-11-1935 to 3-2-1936.

Bellary Circle.

- 13—11—35. Mr. T. Paramasivam Pillai, Kurnool East division on expiry of his leave posted to Bukkapatnam Range to relieve Mr. D. N. Subramanya Iyer, Range Officer, Kadiri in additional charge.
- 18—11—35. Mr. N. C. Mahadevan Pillai, Range Officer, granted leave for 4 months, from 9-11-35.
- 8—12—35. Mr. K. Purushothama Rao, Anantapur division under suspension posted to work under the orders of the District Forest Officer, Kurnool South Division with head-quarters at Nandyal and is restored to duty from the date of joining.
- 11—12—35. Mr. A. Seetharamiah, Anantapur division on expiry of his leave on 17-12-1935 posted to Ganjivaripalli Range, Kurnool East division. 2. Mr. G. Devanayam Naidu, on relief by No. 1 granted leave for 2 months from 2—1—36 with permission to prefix Xmas and New year holidays.

- 6—1—36. Mr. G. Devanayagam Naidu, Ganjivaripalli Range granted leave for 10 days from 3-1-1936 with permission to prefix the Xmas and New year holidays. He should rejoin his old post on the expiry of the leave. 2. Mr. A. Seetharamayya, on relief by No. 1 transferred to Turimella Range, in the same division. 3. Mr. S. Varadarajulu Reddi, Seventh grade on relief by No. 2 is granted leave for 2 months.

Salem Circle.

- 11—11—35. Mr. B. S. Ramaswami Ayyar, posted (on return from medical leave) to Palmaner Range, Chittoor division, to relieve Mr. M. S. Krishnaswami Ayyar, Ranger Sixth grade, granted leave.
- 14—11—35. Mr. P. Shanmugasundaram Pillai, granted further extension of leave for three months from 7-11-1935.
- 5—12—35. On the expiry of the leave on 18-12-1935, Mr. C. B. Ekambaram, Trained Forester Second grade S. P. T. promoted to act as Ranger last grade (New scale of pay) *vice*, Mr. P. Shanmugasundaram Pillai, temporary Ranger Seventh grade granted leave in this office Service Order No. 92 of 1935, dated 14-11-1935, and is posted to the charge of Tammampatti Range, Salem South division. 2. A. Yagnaswami, Trained Forester in charge of Tammampatti Range on relief by No. 1 is transferred to Vellore East division.
- 17—12—35. Mr. C. B. Ekambaram, trained forester Second grade, *sub-protem* granted extension of leave on average pay for one month from 18-12-1935 and on half average pay for 14 days from 18-1-1936 to 31-1-1936. 2. A. Yagnaswami, Trained Forester in charge of Tammampatti Range, Salem South division, promoted to act as Ranger last grade, *vice*, Mr. P. Shanmugasundaram Pillai, Temporary Ranger Seventh grade on leave, with effect from 2-12-1935 (date of relief of Marcel D'Souza, Trained Forester and acting Ranger transferred to Ootacamund Circle), *vice*, No. 1 or until further orders.

Coimbatore Circle.

- 8—11—35. Mr. Kondathu Goundar, Ramapuram Range, Kollegal division posted as Assistant Ranger, Tunacadavu Range, Coimbatore South Division, *vice*, acting Ranger M. Gopalaswami Naidu.
- 14—12—35. Mr. S. Venkatarama Ayyar, Junior Instructor, Vernacular Training School is, on the winding up on the 22nd December 1935, posted to Madura Division on special duty.
- 21—12—35. Mr. T. G. Sankaran Nair, Senior Instructor, Vernacular Training School, Coimbatore South Division, will on the termination of the School, remain attached to the division until 7th January 1936 when he will be relieved for charge of

Ulandi Range in the same division. 2. On relief by No. 1, Mr. K. O. Anandan, Ulandi Range, posted to Kodaiknal Range, Madura Division. 3. On relief by No. 2, Mr. C. R. Raghunatha Ayyangar, Kodaikanal Range will remain attached to the Madura division on special duty till receipt of further orders.

30—12—35. Mr. C. K. Unni, Ranger Seyenth grade, attached to Tunacadavu Range, granted leave for four months with effect from 1—2—36.

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26—8—35. Mr. C. Vasu, on expiry of his leave on the 4th September 1935, posted to Mangalore Range, Mangalore North Dn. 2. Mr. M. Rama Rao Kini, on relief by Mr. C. Vasu, transferred to the Nilgiris Division, for special duty.

7—11—35. Mr. M. S. Subbiah, Acting Ranger, (last grade), is posted to charge of Segur Range, The Nilgiris. 2. Mr. K. Karunakaran Nambiar, Ranger Second grade, Segur Range, on relief by No. 1, posted to Mudumalai Range in relief of Mr. P. A. Madhavan, granted leave.

22—11—35. Mr. B. M. Coates, Mannarghat Range transferred to Nilgiris Division for special duty, in connection with Boundary verification. 2. Mr. Marcel D'Souza, trained forester Second grade, and acting Ranger last grade, posted to Mannarghat Range.

17—12—35. Mr. C. Sankunni, Begur Range, Wynad Division, granted leave up to 18th March 1935 from date of relief. On expiry of leave, he is posted to Mysore depot. 2. Mr. P. K. Sankara Menon, Ag. Ranger, last grade, (Assistant Range Officer) to relieve No. 1, and be in charge of Begur Range untill relieved by No. 3. 3. Mr. J. S. Rowland, Udipi Range, Mangalore North Division, on relief by No. 4, transferred to Wynad Division and posted to Begur Range. 4. C. J. Muthanna, Trained Forester, Nilambur Division, transferred to Mangalore North Division to Udipi Range.

28—12—35. Mr. C. R. Raghunathan, posted to Udipi Range, Mangalore North Division. This cancels the posting of Trained Forester C. J. Muthanna to Udipi Range.

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NOTICE.

“Indian Forester Prize” - 1936.

Essay Prize for PAST Students of the College.

The subject for the essay is:—

“A RANGER'S EXPERIENCE IN CONDUCTING FOREST CASES.”

A prize of the value of about Rs. 25/- will be awarded for the best essay from past students.

No award will be made unless a satisfactory standard is reached. The essay should be clearly written or typed on one side of the paper only and should not exceed 2000 words. It should be submitted to reach the Principal, Madras Forest College between the 10th May and 1st June 1936. Any not received within this period will not be considered. The essay should be the unaided work of the competitor.

P. W. DAVIS.

NOTICE.

"Indian Forester Prize" - 1936.

Essay Prize for PRESENT Students.

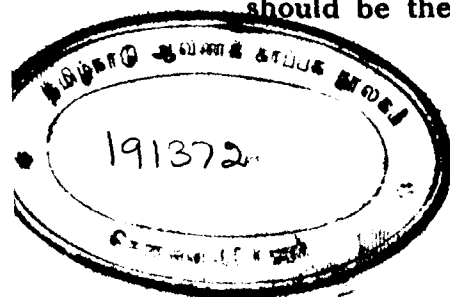
The subject for the essay is:—

"THE IMPORTANCE OF ECOLOGY IN FORESTRY."

A prize of the value of about Rs. 25/- will be awarded to the best essay by present students of the College. No award will be made unless a satisfactory standard is reached. The essay should be clearly written or typed on one side of the paper only and must reach the Principal between the 10th May and 1st June 1936. Any essay not received within this period will not be considered.

The essay should not exceed 2000 words. It should be the unaided work of the competitor.

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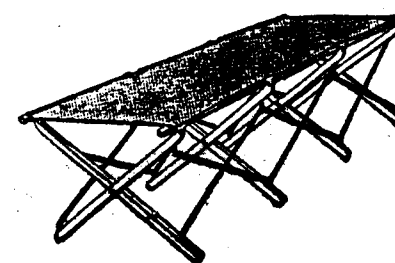
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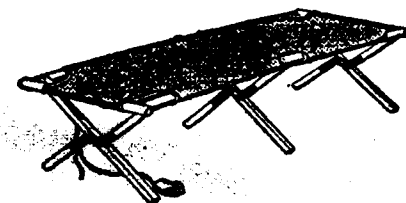
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