

VII. WHY FICUS, WHY MORACEAE?

As a student, I used to enjoy 'Karsten and Schenck' propped up on the breakfast-table. With equal familiarity I treated 'Kerner', 'Schimper', and other great picture-books of botany. The time came to translate the dreams of youth into vocation. "Protista", said the professor of zoology, "are the pivot of biology". I substituted my breakfast-reading with the *Archiv für Protistenkunde*, and hesitated at the coming call of biophysics. Ever since I have been rent, like the morning toast, by two forces which would make of me a student of the microcosm of protoplasm and a disciple of its greatness. They are the forces splitting biology into macromolecules and macro-organisms, and I do not know how this rift may be spanned. I cannot conceive what energy level, chemical bond, or carbon-grouping can decide whether it is insect-pollination or curiosity that will be inherited. But the pendulum has swung. The young botanist no longer looks at these books; he models molecules and chromosomes, and works very largely in vitro. Nevertheless, if biology is not to stand still, the pendulum will return and its amplitude will be the strength of those who have put their trust in the macrocosm.

These were the thoughts which I vaguely entertained, when I found myself in the forests of Malaya and I measured my insignificance against the quiet majesty of the trees. All botanists should be humble. From trampling weeds and cutting lawns they should go where they are lost in the immense structure of the forest. It is built in surpassing beauty without any of the necessities of human endeavour; no muscle or machine, no sense-organ or instrument, no thought or blueprint has hoisted it up. It has grown by plant-nature to a stature and complexity exceeding any presentiment that can be gathered from books, and it is one of the most baffling problems of biology.

It happens, though no one knows why, that among the giants of the forest and among its dwarfs and tangles of strands there occurs a kind of plant which is very easy to recognise. I mean, of course, the fig. It is a relief to be able to recognise something where everything is strange, and a friendship springs up when this something is all pervading. By themselves the figs could build a forest, though its undergrowth would be urticaceous. I was impelled to study figs in order to learn about the forest, where my dreams had come true. Their variety offered a key to its evolution, and evolution is a notion which links in some degree macrocosm with microcosm. The connexion dimly appeared in 1930. Twenty years later, the wheel of fortune restored me to the cloisters where philosophy prevails.

Firstly, however, what names should the figs have and what classification? Taxonomy must lead, and I harnessed myself to the Flora Malesiana. The temperate herbarium is the merest shadow of the forest, but it is a more suitable place for intensive thought than the tropical forest, because there are so many distractions in that hub of activity. "Here is the key" said Professor Lam, "but you are not allowed to sleep in the building". Nevertheless, as I worked in the little room at my disposal on the historic collections of Leiden and the sixty or more boxes of unidentified specimens from Asia, I was nightly transported. To be able to marshal before one the labours of others, to compare the notes of botanists who have studied the specimens, to refer to the piles of open books, and to reflect on the living vegetation, is a privilege. I saw how George King had scrawled his majestic way in the brief time available to him through the minutiae of Miquel's compilation. I found among the unnamed specimens the answers to the errors of others, and, as often as not, among specimens collected by themselves. I saw the pattern of classification pricked out on the map by the repeated collections of the field-botanists such as Wallich, but among whom, with all his mistakes, Koorders is pre-eminent. So I went for several years from one herbarium to another, with the growing delight of increasing mastery. But all the time, the weight of notes was mounting. By 1959 I had a pile of foolscap over a metre high. It had to go to the printer, because I could handle it no longer.

Every herbarium is an anthology. The plaguiest bits, consisting perhaps of a petiole and fragment of a lamina or the half of a fig, have their histories. The microscopic bent found an opening in detecting from epidermal characters the nature of these pieces, and I imagined what a lot of genera palaeobotany could make out of fig-fragments. In Paris, I came upon the copious undistributed collections of Poilane from Indo-China, and, when we had worked through some forty or fifty bundles with quantities of detached leaves, the floor in that bay of the herbarium reminded me of the floor of the forest; the 'dust of centuries' rose in a cloud over the sweeping and settled again in sanctity. The sorting taught me a lesson. Bits are often detached in the handling of unmounted specimens; when, therefore, a cauliflorous species has never been collected again, consider if it is not a "mixtum compositum" of pieces wrongly packed. I have detected ten or eleven such false species and found, in proof, their counterparts wrongly named from leaf or fig. On some of Poilane's mounted specimens there was written in red ink that this was to replace that destroyed one Saturday night when Pételot denigrated botany. These powerful collectors had, it seems, a row with sad consequences over some identifications,

but it never fell to my lot to encounter another sycologist. Nevertheless, when I discovered one wintry afternoon that the Linnean type of F.retusa L. was not the common F.retusa of botany, I nearly succumbed to the temptation of Pételot; I still think it might have been the best solution, but the taxonomist must be patently objective and, therefore, completely honest. In a packet on another sheet in Paris, where there should have been dried figs, I found the remains of a cheese sandwich. Thus I learnt to respect the herbarium rule which forbids eating among the specimens, for I suppose the director would be responsible if poisoned fruits were swallowed. Not the least hazard, however, in the herbarium is the ladder. That at Bogor, made of widely spaced bamboo, was the most precarious, so that any attempt to consider species on it lead to disaster. Even the high pulpits provided at the British Museum should carry a warning, lest the visitor step back in contemplation of his work: for all these moments are to him all-absorbing conflicts in the mind. Yet these pulpits inspired me to insert a doggerel verse in the first cover of Ficus. In the cross-country journeys to Kew I learnt from lorry-drivers to whom I gave lifts, as they came off duty, all the short cuts through the north of Greater London. Starting at 6 a.m. to avoid the traffic, though often delayed by tardy pigeons seated on the road, I would arrive at 8 a.m. and be admitted so early to the Herbarium by the corporal whom I knew. One morning he was not on duty and the director received an irate report that a tall Australian had forced an entry. In Florence I peeped into a closed room and found the old manuscript notes, lectures, and correspondence of Micheli; it reminded me of the closed room in the school in Manaus where I smelt the library of Barbosa Rodriguez mouldering since his departure. I do not believe that any one knows the histories locked up in the herbaria, great and small, of the world.

The real taxonomist must observe four matters of routine. Firstly, he must maintain a card-index of every species with its place and date of description and its subspecific categories, for these are seldom catalogued. Secondly, he must maintain a card-index to all collections named by him. Sooner or later he will have to name all over again the same collections in other herbaria or such as are sent to him, as the expert, for identification. Reference to these cards is, then, often quicker than re-identification by reference to the stack of manuscript. The specialist must pay this price for his skill: half my luggage on fig-journeys used to be card-indexes. Thirdly, he should describe and draw in pencil every species as though it were new. Thus, only, can he impress on his mind their characters and revive his memory when, years later, the classification of a big group comes to

be worked out. Some say they cannot draw; nor could I, but drawing can be learnt like arithmetic. Others say it takes too long, but I find that it saves time eventually and that much more time is lost in re-reading without a drawing. Fourthly, the taxonomist should use scrolls to make lengthy and detailed tables of comparison for all species in order to work out their relations. Such tables are the only means of presenting the mass of information in a conspectus; they free the mind, thereby, from the burden of details: it creates as they unroll.

This last point is so important that I must emphasize it. I have not met any book on taxonomic method which mentions tables of comparison. Many of these authors, it seems, cannot have struggled deeply with their subject, for such tables are absolutely fundamental where comparison and classification of taxa, whatever their category, are undertaken. Keys, then, are constructed from these fullest means of comparison. They should not be based on hunches or superficial requirements. First hunches lead usually to artificial classification into grades because, in any large taxon, parallel evolution has been rife; what one genome has done, so may have another. Later hunches may lead to the phyletic alignment expected of a monograph, but without tables they cannot be checked thoroughly in the multiplicity of entities. The table, however, may render evident at once the common factor of a genome-series.

Supplied with these summaries of his herbarium-research, the taxonomist must start the serious work of classification. If he is not gifted with a good memory or has not trained his memory, he should never have started. Here, I suppose, machines may enter and with processed cards dispense with mental effort, but I have yet to discover where taxonomy has money to spend on machines. Furthermore, it is during the hours of excogitating the information that the taxonomist learns the meaning of taxa, their evolution, diversification, and dispersal. They are the best hours of his work. When, two or three weeks later, he resumes his problem, his ordered mind will have sorted the information, subconsciously weighted the factors, and arrived at an answer. It will not be perfect because the dead material on which he worked cannot be perfect, but it will show him where, if he can get the money not spent on a machine, some one should go for more information.

I have now completed more or less satisfactorily the taxonomic account of Ficus in Asia and Australasia. The part for the Flora Malesiana is ready, and the whole is to be presented in the Singapore Gardens' Bulletin as a check-list of species and synonyms together with keys for identification. At length, therefore, the botany or philosophy of the

genus can be started. Editors, however, are exacting and, while Dr. Jarrett has been dealing with Artocarpus and its allies, I have been rounding up 'other Moraceae'. It has been illuminating to see the treatment of the other genera in the light of Ficus. Having started with the big genus more or less in a prime of its development, I can see what fragments most 'other Moraceae' are. If all but a miscellaneous hundred species of Ficus became extinct, these fragments of the genus could be treated as genera comparable with most of the small Moraceous genera. As Ficus is the sole, and manifold, genus of its tribe, thus I can perceive only one comparable genus for each of the other so-called tribes. I think all Moreae are fragments of one big genus Morus, equivalent to Ficus, just as Dorstenia is the one genus of Dorstenieae. Nevertheless it may not be right to make one genus of Artocarpeae or Olmedieae because we do not know enough about many of their so-called genera to decide where they should be classified. Though I would re-set the classification of Moraceae on the basis of its greatest exponent Ficus, there is not yet sufficient knowledge to do so.

I am reminded of the sandstone table-lands, or mesas, that border the Amazon valley or the limestone hills which dot the Malay Peninsula, Thailand, and Indo-China. Time has cut their two generic formations into scattered blocks. The Andes and the Himalayas rise in contrast like Ficus. The many small genera of Moraceae are but hillocks of a geological formation; the science of botany, coping with its multitude of problems, requires that the major formations, not the fragmentary hillocks, should be its genera. The attempts to classify Moraceae are all, as yet, very imperfect. After years in the field, followed by years in the herbarium, the botanist can see afresh and hand on to the next generation the knowledge where more exploration, more collecting, more ecology, more anatomy, and more comparison are needed to improve understanding and classification. So the pendulum is swung that it may in time come back to the chemistry and protoplasmic structure of this successful family.

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