



Parija



# PRANAKRUSHNA PARIJA

(1891-1978)

Foundation Fellow 1935

PRANAKRUSHNA PARIJA was born on April 1, 1891 in Icchapur, a small village near Balikuda about 60 km from Cuttack in Orissa. His father, Shri Biswanath, was employed in the Forest Department in Mayurbhanj, then a princely State. It was he who infused in young Pranakrushna, a love for trees and plants. His mother, Shrimati Jayanti Devi, lavished love on her only son.

## EDUCATION

Parija started his education under a village (Chatasali) school-master's supervision. It sharpened his memory, which could later help him in remembering names and details of his chosen field of study. Also ingrained in him was the high ideals of Hindu mythology and ethics. Thus, a sound base for his exalted academic career was laid right from his primary education. But for his father, he would have left studies and resigned to the keeping of land records. His father got him admitted to the Balikuda Middle English School in 1901. He completed the usual four-year course in three years, standing first in the whole of Orissa. He got a monthly stipend of Rs. 4.

Pranakrushna entered the Ravenshaw Collegiate School, appeared in the entrance examination of the Calcutta University in 1909 and stood first amongst the candidates from Orissa. It was, indeed, a rare achievement. With a monthly scholarship of Rs. 20, Pranakrushna entered Ravenshaw College, Cuttack. He stood first in the Calcutta University I.Sc. examination held in the year 1911. He then joined the Presidency College, Calcutta, for his B.Sc. and was the recipient of a monthly scholarship of Rs. 25. He had to work as a private tutor to meet his financial needs.

Parija was still an M.Sc. student in Calcutta when he was selected by the Provincial Government of Bihar for higher studies in Britain. He entered the Christ College of Cambridge University in 1914. After finishing Tripos Part I in 1916, he studied Botany under the world renowned Professors Steward and Blackman in Tripos Part II and passed the latter examination securing a first class and standing first in order of merit. This won for him the Frank Smart Prize and Fellowship for research. He worked on respiration of Cherry laurel leaves under the guidance of Professor F. F. Blackman. After the completion of two years of fellowship, he was employed by the Government of Britain for a year to devise the best method of storing apples. The results which he published jointly with Blackman in the form of papers are now classical.



During his seven years stay at Christ College, Cambridge, Parija was the Secretary and later the President of the Indian Student's Majils and came in contact with noted figures such as Jinnah, Sarojini Naidu, Tilak and many others. Birbal Sahni, Chintaman Dwarakanath Deshmukh, Afzal Hussain, Hanumanthrai, Srinivasa Ramanujam, John Mathai and others were his contemporaries at Cambridge.

On return to Orissa in August 1921, Dr Parija joined the Ravenshaw College, Cuttack, as Professor of Botany in the Indian Education Service and lived in the West Hostel as a warden. He was an ideal teacher and came in intimate contact with students who considered him as a philosopher and a guide. He taught them more by example than by precept. His classes were always lively and his lectures immensely interesting. He unfolded to his students the mysteries of plant life which inculcated in them the spirit to learn the subject in depth. Parija also helped the needy students financially. He used to contribute Rupees two hundred per month out of his salary for this purpose.

## RESEARCH

It was due to Parija that the Ravenshaw College became a centre of higher learning and research in India. Many brilliant students like the late Professor S. M. Sircar, Professor T. C. N. Singh, Professor P. Misra, Professor B. Samantrai, Professor B. N. Sahu and many others were initiated into research by him.

The work carried out by him falls broadly under three categories, viz. (i) fundamental and applied aspects of plant physiology, (ii) experimental plant morphology and (iii) ecological studies of plant environment.

While at Cambridge, young Parija was given the problem of studying drifts in the rate of respiration of apples maintained in cold storage at 2.5°C. The interesting fact was that in the ripening of fleshy fruits, senescence was the dominant stage of ontogeny. Side by side with investigations on respiration of apples, a good amount of research was also carried out on respiration of evergreen leaves which continue to exist in a state of maturity for long periods. Parija wanted to determine if the two organs, the evergreen leaves and the ripening fruits, so different from each other manifested the same fundamental principles of catabolism. In the first paper of a series he wrote with Professor Blackman, in 1928, it was shown that respiration of an apple in ordinary air was an integration of two independent but opposed processes which are at work during senescence. One was the starvation drift at 22°C which tended to lower respiratory activity while the other was expressed as rise of hydrolysis activity.

In the second paper, Parija (1928) presented the behaviour of individual apples alternately in air and in nitrogen. He found CO<sub>2</sub> production by nitrogen respiration (NR). It was concluded that the total carbon loss was three or more times greater in nitrogen than in air. The question that arose was what happened to this deficit of carbon in air. The answer was presented by Blackman (1928) in Part III of this investigation through a scheme of reactions comprising the respiration sequence of at least half-a-dozen catalysed reactions. According to this scheme, carbohydrate reserves in apples are hydrolysed to hexoses and activated to heterohexoses which are converted by glycolysis to methyl-glyoxal. The last reactions were considered to be dependent



upon the presence or absence of  $O_2$ . In nitrogen i.e., in the absence of  $O_2$ , the final products were  $CO_2$  and alcohol in the usual ratio. On the other hand, in air and other concentrations of  $O_2$ , the final products were water and  $CO_2$ . Thus, no carbon derivatives accumulated in the tissues finally during the OR-stage. So the logical conclusion was that in air, a part of the last stage reactants was somehow worked back into the system occasionally by  $O_2$  and this they termed "oxidative anabolism (OA)."

On return to India in 1921 and joining as Principal, Dr Parija devoted himself to the development of Botany in the Ravenshaw College, Cuttack. It was due to his untiring efforts that this College acquired a name and became a centre of higher learning and research in Botany, particularly in Plant Physiology. He tackled both applied and fundamental problems which were considered of importance for national development. These included :

#### (a) *Studies on Water-Hyacinth and other Aquatic Weeds*

The spread of water-hyacinth was so alarming that expert committees were set up all over India and Burma to study the details of the life-cycle of this plant so that methods to control this obnoxious weed could be evolved. The Imperial Council of Agricultural Research granted financial assistance to Parija to study this problem in Orissa. In this scheme, studies on transpiration and absorption were conducted by the late Professor S. M. Sircar. It was found that the seeds retained their viability for seven years. The germination of water-hyacinth seeds was like that of date and Borassus. Light hastened the floating of water-hyacinth seedlings and the weed flourished in a wide range of pH with optimum growth at pH between 6 and 8. It was further shown that the plant could withstand a considerable degree of drought. Copper sulphate was found to be the most effective against not only water-hyacinth, but also against *Pistia* and *Salvinia*.

#### (b) *Studies on Respiration*

Parija and Saran (1934) reported that short exposures to light influenced the rate of respiration in the leaves of *Aralia*. Red light had no effect, while blue and violet affected respiratory rates in the same way as white light. The increase in the rate of respiration was, according to them, due to the hydrolysis of food reserves, activation of enzyme systems or change in the permeability of cells. They studied the rate of respiration of the amphibious plant *Scirpus articulatus* L. in both phases of its life cycle i.e., under water as well as in air and found that the rate of respiration of the scapes was higher in air than in water. This was ascribed to low concentration (2.3–2.6 per cent) of  $O_2$  dissolved in water.

#### (c) *Studies on Transpiration and Heat Resistance*

Parija and Mallik (1936) noted that cuticle formation in *Ficus religiosa* was not induced by dryness alone but was induced when dryness was coupled with light. It was further shown that while red rays were ineffective, blue rays induced cuticle formation. In 1939, Parija and Samantarai studied the drifts of transpiration in the leaves of *Datura alba*, *Helianthus annuus* and *Ixora undulata*, from the measurable



stage till their fall. They observed a characteristic curve of transpiration for each leaf with a rise, then a fall to a steady value and finally a decline.

Again in 1940, Parija and Malik reported that oily seeds resisted the effect of high temperatures better than the starchy ones. Amongst the oily seeds also, it was found that resistance to higher temperatures increased with increase in oil content.

#### (d) *Studies on Experimental Morphology*

Parija and Misra (1933) were the first to establish that the thorns on the stem of *Bridelia pubescens* Hurz were morphologically roots and were apogeotropic. Later in 1935, Parija studied peg formation in the seedlings of *Cucurbita maxima* raised from seeds germinated in different positions and under different light conditions. It was found that in seeds placed vertically with micropyle upwards, the radicle bent downwards and the pegs were formed on the concave side. On the other hand, in seeds placed vertically with their micropyle downwards, the radicle grew straight down and the pegs developed always nearest the slab. When no particular side was influenced by gravity but one side was darker, a vegetatively heliotropic peg developed on the less lighted side.

Again Parija and Malik (1936) proved experimentally that suberisation of the cell wall at the sutures of five carpels in longitudinal furrows supplemented turgescence in the cells of the fruit wall in the mechanism of bursting of balsam fruits. In 1936, Parija along with Samal studied the distribution, structure and development of glandular hairs and extra-floral nectaries in *Tecoma capensis* Lind. It was confirmed that the extra-floral nectaries originated from the glandular hairs. They suggested that the Patelliform glands probably helped in self-pollination of flowers by keeping the unwelcome ants fully fed with honey secreted by these glands and thereby prevented them from visiting other flowers, which would have brought about cross-pollination.

P. Misra in 1963 studied the occurrence of medullary cork in *Ipomoea crassicaulis*. The physiological and anatomical adaptations of this plant to varied ecological habitats were fully worked out.

In 1967, Parija studied the growth of the ovary of *Momordica dioica* when its flowers were pollinated with the pollen of *Luffa acutangula*.

#### (e) *Studies on Rice*

The Government of Orissa, Department of Agriculture, sanctioned a Rice Research Scheme in April 1937 and Professor Parija was entrusted with the task of investigating physiological aspects of this plant. Later, the scheme was financed by the Imperial Council of Agricultural Research from April 1, 1942 through March 31, 1945. It was found that in the rice plant, flood resistance was induced by pre-sowing treatments of seeds (i) with low temperature (2–5°C) for 6 days (ii) by subjecting the seed to anaerobiosis (O<sub>2</sub> free air) for 3 days or (iii) to an aerobiosis coupled with low temperature for 3 days. The treated plants survived better than the controls when submerged under water and gave a higher yield. The stem anatomy of flood-resistant varieties was rather peculiar and exhibited a sclerenchymatous band of tissue around



the cortical lacunae. It was also shown that pre-sowing treatment of seeds at higher temperature of 40–42°C induced drought resistance in rice plants.

Similarly, Parija with his team of researchers evolved a pre-sowing seed treatment with 1.7 per cent common salt solution for saline resistance and found that saline-resistant varieties had highly suberised exodermis in their roots. They also evolved various seed-treatments such as smoking, drying, dehusking and soaking with the juice of germinated grains to break dormancy in winter types for growing them as Dalua.

#### (f) *Studies on Algae*

During the course of investigation on the life histories of weeds of Chilka lake in connection with malaria which prevailed around that area, Parija and Parija (1946) studied the algal succession on a little rocky island named Charaiguha in the lake and found that diatoms extended through all the zones and appeared twice annually, while *Polysiphonia* appeared in January and continued till May and required moderate salinity. *Ceramium* was found growing there from February to April under high salinity conditions. *Cratolouphia* did not grow at the water edge but occupied the lowermost zone to avoid damage by the waves, and required high salinity for profuse growth. Diatoms and red algae grew in deeper waters and consequently under conditions of feeble light. Amongst the green algae that inhabited the lake, *Chactomorpha*, *Enteromorpha* and *Cladophora* were noteworthy. Parija and Parija also investigated the utilization of aquatic flora of the Chilka lake as raw material for manufacturing agar-agar.

In 1969, Parija, Patnaik and Rao in a research scheme on mass culture of algae financed by the Indian Council of Agricultural Research made a survey of the blue-green algae in the soils of Cuttack and found that *Phormidium*, *Microcystis*, *Cylindrospermum*, *Anabaena*, *Aphenotneca*, *Oscillatoria*, *Rivularia* and *Nostoc* were the predominant genera in those soils.

It was Professor Parija who initiated many of the present day botanists into research. Several of his students attained great academic distinctions and later became well known in their research careers. The importance that plant physiology gained as a field of botanical study in this country was mainly due to Professor Parija who thus became a legendary figure. He rightly came to be considered as the grand-old man of Indian Botany.

### EDUCATIONAL ADMINISTRATION

Professor Parija was the Principal of Ravenshaw College, Cuttack from 1935 to 1945. He revamped the College administration with several of his new original ideas. Thus, a tutorial system in the College was started to advise and guide students by personal contact. He also introduced the system of having a student as the President of the College Union, encouraging thereby the student community to take up positions of responsibility. The success of these ideas is apparent from the fact that many student leaders became State leaders in various fields. Professor Parija was no doubt a strict disciplinarian but his decisions always had an element of



humaneness. Under his stewardship, an annual extramural lectureship was instituted in the college, which was well received by the entire educated masses of Cuttack. Magnanimous and ever ready to help needy students, Professor Parija was averse to making them dependent on charity. A student's Labour Bureau was thus started where students could work part-time and earn to sustain themselves. It inculcated in them the spirit of self-reliance and dignity of labour.

Professor Parija was the first Vice-Chancellor of Utkal University. Able leadership is crucial for the proper growth of any organisation, and more so, for an educational institution. Utkal University was fortunate in that it was able to obtain the services of an experienced and dynamic leader in Parija in the early stages of its growth. Parija had, of course, a challenging and difficult task, but he brought to bear upon it his vast and rich experience. His scientific and modern outlook, deep scholarship and unbounded humanism went a long way in moulding the Utkal University and even today it bears the stamp of his personality.

Professor Parija left the University to render service, first to the State Government and later to the Banaras Hindu University as its Pro-Vice-Chancellor from 1948 to 1951. However, he continued to be the Pro-Chancellor of Utkal University from 1951 to 1955. Again from 1955 to 1966, he provided leadership to Utkal University for two terms as its Vice-Chancellor. The University Departments of Philosophy and Sanskrit were started in 1957 and of Psychology, Statistics, Political Science and Anthropology in 1958. Professor Parija was alive to the needs of education in commerce in the State. M.Com. classes in the campus were started in 1962.

In 1945, the Development Department of the Orissa Government was reorganised and a new Department of Agriculture was created with Professor Parija as its first Director. The 'Grow more food' campaign became a success because of his leadership. During his Vice-Chancellorship of Utkal University, Professor Parija also acted as the Chairman of the Standing Committee on General Education. In 1962-63, he was elected as the Chairman, Standing Committee, Inter-University Board of India and Ceylon. He was also elected to represent the Board in the Council of the Association of Commonwealth Universities in 1963. Parija was also elected as the Vice President of the Tenth International Botanical Congress held in Edinburgh in August 1964. Earlier, as a Pro-Vice-Chancellor of the Banaras Hindu University he also became the Honorary Professor of Botany during 1949-51.

## HONOURS

Parija was associated with a large number of scientific and academic bodies in the country and abroad. He was the President of the Botany Section of the Indian Science Congress in 1930. The Indian Botanical Society grew up under his guidance. He was member of the Patna University Senate and Syndicate for several years and rendered valuable service, in recognition of which the Patna University conferred upon him the Degree of Doctor of Science (*honoris causa*) in the year 1944. It was in 1935, that he was elected as Foundation Fellow of the National Institute of Sciences of India (now the Indian National Science Academy). In 1949, he was appointed Member of the Central Advisory Board on Forest Utilization. During



1953-54, he served as Chairman of the Expert Committee of the Government of India, Ministry of Food and Agriculture, to report on the reorganisation of the central agricultural research institutes. Again in 1955, he was appointed Chairman of the Language Commission of India. In the same year, he was awarded the *Padma Bhushan* by the President of India.

The highest award for a devoted scientific career came to Parija when he was elected General President of the Indian Science Congress Association to preside over the Bombay session held in January, 1960. Earlier he had been the General Secretary of the Indian Science Congress Association for five years. Parija was also active from 1966 to 1970 as a member of the Board of Management of Orissa University of Agriculture and Technology, Bhubaneshwar. He rendered valuable service to the University which in recognition thereof conferred on him the Degree of D.Sc. (*honoris causa*) in 1976.

### LEGISLATIVE DEBUT

Parija was not only known in scientific and academic fields but was also popular with the people of Orissa. He was elected to the Orissa Legislative Assembly from his home constituency of Balikuda as an independent candidate in 1952. He proved himself an able administrator and piloted the Cuttack Improvement Trust Scheme which became a reality two decades later. However, Parija could not fit into politics since he was not an opportunist, and hence could not retain his seat in the next general election. In Orissa, Parija had become a living legend; not only was he regarded as a great scientist but also a man of great achievements in cultural and political fields. He was, for several years, President of the Utkal Sahitya Samaj, the foremost literary organisation and of the Utkal Sammilani, the prestigious political organisation of the Oriya speaking people.

### MARRIAGE

Parija was married, in 1922, to Shrimati Sundramani, daughter of Shri Gourang Charan Kanungo of Balinadia on the north of the river Birupa. They remained married for 56 years and by a strange coincidence Parija died only two weeks after the death of his wife in 1978. Colleagues of Parija will fondly remember Mrs Parija's kind hospitality and generous nature. She was responsible for the great achievements of Parija to a great extent. For the young students who lived in the College compound when Parija was the Principal, Mrs Parija was almost like a mother.

Parijas were survived by two sons and one daughter. One of the sons, Shri L. I. Parija, I.A.S., is Commissioner in Orissa Government and the other, Shri P. R. Parija, is a trained geologist engaged in personal business at Cuttack. Their daughter, Dr Saudamini, is Reader in Health Education in the Department of Physical Education in Panjab University, Chandigarh and is the wife of Dr R. P. Bambah, Professor of Mathematics in the same university.

### PERSONAL ATTRIBUTES

Professor Pranakushna Parija was a scientist of world renown. A great scholar, a revered teacher and an eminent educationist, he was also a household





figure in Orissa because of his distinctive achievements in cultural, social and political fields as well. He was a source of inspiration and encouragement to young intellectuals and scientists, particularly to the present generation of Indian botanists. Even a brief contact with Parija evoked admiration for his simple and noble yet very rich mind, a literal Midas's touch of his luminous erudition. During his 87 years, he left an indelible impression on scientists and other public figurers of his time. Although a perfect human being is an Utopian far cry, Parija reached very near to being one. His versatility and excellence in many fields bear testimony to his capabilities.

Parija is known for his simplicity and straightforwardness. His kindness and courtesy endeared him to one and all. His concern for punctuality and demeanour was infectious. The value of time and its proper utilisation were the envious legacies left behind by Parija.

Parija had a knack of conducting meetings pleasantly and purposefully. There was no room for ambiguity or acrimony. Issues were clinched and decisions recorded in the most systematic manner. He was a well-read man and had memorised many sanskrit slokas and Oriya folk-songs, and these often served him well in easing tense moments at meetings whenever tempers flew high.

From humble beginning he rose to international heights in the realm of science and also became an erudite scholar and able administrator. He died on June 2, 1978 in Cuttack. The fragrance still lingers even though the rose has withered, leaving behind a legacy of richness and wholesomeness of a great man.

K. K. NANDA

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