

Nature Watch

Singapore's Jurong BirdPark: A Study Model

Abraham Verghese



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Birds can be studied essentially in two ways: by observing them in the field or in an aviary. If the latter happens to be a large aviary, which nearly simulates the natural habitats with walk-in facilities, then it would be a category of study that would be different from the first two. Such an aviary may be more appropriately termed a BirdPark. In conventional aviculture, only aviary birds like budgerigars, finches, parrots, etc. breed and survive. But, non-aviary birds if caged, would exist without manifesting most of the normal life cycle or behaviour seen in the open. However, in a BirdPark, when larger expanse of space, both horizontally and vertically are netted, several habitats and niches can be created for birds. Such a situation would sufficiently suit non-aviary birds, so that they would be capable of completing their life cycles in captivity. Such a BirdPark exists in Jurong, Singapore and is an ideal model for the study of various aspects of bird ecology and ethology. This is described here to highlight the potential such BirdParks have in ornithological education, research and bird conservation.

Jurong BirdPark (JBP) was built at a cost of \$3.5 million (excluding land cost) and is spread over 20.2 hectares. It is the largest BirdPark in the Asia Pacific, and has a collection of more than 8,000 birds from over 600 species. The park specialises in birds from Southeast Asia and the more exotic and colourful tropical birds. It also has walk-in aviaries and a man-made waterfall.

The BirdPark helps one to understand the rich bird diversity their morphological adaptations, behaviour and forms existing in nature, in a short span of time. For example, the BirdPark gives insight into behavioural adaptations like underwater feeding of penguins, or night hunting in owls. Rambling through



the 20 acres of this BirdPark can potentially stimulate people into watching birds out in the world. So, it is ideal for high school and college students, biology teachers, birdwatchers aviarists and ornithologists.

This article is, therefore, written with three objectives: one, to encourage development of a BirdPark like JBP as a study model in India and elsewhere. Two, to create awareness of bird life and generate interest in amateur and serious ornithology and three, to help promote conservation of endangered birds by captive breeding. Though birds can be seen in closer proximity here, as compared to wild, a pair of binoculars would certainly enhance viewing, and in addition a notebook is recommended for documentation.

These, more or less match the objectives of JBP which are as follows:

Conservation: To ensure bird life by encouraging the breeding of birds in general and endangered birds in particular.

Research: To study and to contribute to ornithological knowledge.

Education: To help the public by all available means to a greater understanding of birds in particular and nature in general.

Recreation: To enable people to enjoy the wonders of bird life as part of our natural heritage and to appreciate the beauty of the BirdPark.

The JBP has the following areas which contributes to bird education.

Bird Shows

a) Birds of Prey Shows: Fuji World of Hawks Show (10.00 am daily) and King of the Skies Show (4.00 pm daily).

The bird show provides education through antics. One can gain an insight into the hunting habits of birds of prey. These birds which include falcons, are put through simulated foraging situ-

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ations. The foraging behaviour of Brahminy Kite and the White-bellied Sea Eagle are demonstrated. The Snowy Himalayan Griffon Vulture responds to a dummy buffalo carcass. This show enables one to observe and comprehend the hunting habits of birds of prey. They sight the prey, and descend on to it with precision, lifts the prey in its claws and fly to a perch to devour or attempt at devouring while in flight, much the same way as it is in a real situation.

b) All Star BirdShow: 11.00 am & 3.00 pm daily

The All Star BirdShow features cockatoos, macaws, flamingos, pigeons, birds of prey, pelicans, hornbills and others. This show begins with a parade of several large birds trooping into a centre stage. The author observed that this kind of assemblage excited school children who had gathered to watch the show. Besides highlighting the antics of birds like the mimicking cockatoos and cycling macaws, the All Star BirdShow features the natural behaviour of birds like pelicans, emus and hornbills. This is an entertaining and educational show for visitors of all ages demonstrating how birds can be trained to perform. The JBP All Star BirdShow is staged at the Pools Amphitheatre. This semi-circular amphitheatre, can seat 2,000 people. The show is well compered by the staff in an educative and entertaining manner. This is important as running commentary enhances education. Training comper then is an integral part of such shows. A lady comper made all those who had birthday on that day stand up, and a Cockatoo sang 'Happy birthday to you...'. The bird also counted from one to ten both in English and Chinese. Bird mimicking is better appreciated if heard, and therefore, BirdPark should be places where these can be demonstrated. A Sulphur-crested Cockatoo has been trained to pick money (a note) from public, bring it to the trainer and then return it to the owner. The observers can get an insight into learning in birds. Perhaps, the training started while the birds were young. It gives an opportunity to study birds response to various stimuli, as in the case of Sulphur-crested Cockatoo, a currency note held high in the owners hand is a stimulus, to which the bird is trained to pick.



BirdPark Panorail

A ride on the Panorail is a 'see and learn' situation. Besides, it has a commercial (tourist attraction) angle. This air-conditioned monorail system has been aptly called the BirdPark Panorail because of the view it offers as it glides above the ground, between tree tops and over water; passing as close as possible to the different exhibits at varying heights. The panorail skimming over the lakes help to watch the water birds at a close range. The BirdPark Panorail allows the elderly and handicapped, to watch bird life without much physical strain. There is a running commentary synchronising with the sights as the train glides along. This is a clear audio-visual (natural) educational approach that facilitates understanding while observing.

Flamingo Pools

The flamingoes in general are the largest and most brilliantly coloured of the wading birds. It thrives well in brackish water and feeds with its bill upside down, filtering tiny particles such as algae and small worms through its bill and tongue. At the Park one can observe this unique feeding habit at a close range, which in nature may be difficult to appreciate, as flamingoes generally forage in inaccessible mud flats like the Rann of Kutch in Gujarat. At the BirdPark, an open-concept design with a beautifully landscaped lagoon allows visitors to enjoy the beauty of these birds, especially courtship. Flamingoes are among the most social of birds, and many behavioural group displays can be watched at a close range to appreciate the sociality amongst them. The Park has four species of flamingoes housed in their own pools. Indian Lesser Flamingo is at home here. Two endangered species, the Caribbean and Chitean flamingoes are represented here.

Penguin Parade

The Penguin Parade occupies an area of 1,630 m². There are five species on exhibit viz., the Humboldt, the Rockhopper, the Macaroni, the Fairy and the Majestic King Penguin (there are

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17 species of penguins in the world). The best time to watch them at JBP is at the feeding time at 10.30 am and 3.30 pm.

The Penguin Parade has a large pool set against a landscape of rocks, cliffs, nesting alcoves and burrows, with a temperature of 16 °C. This simulates the birds natural habitat in the Antarctic. A special lighting system recreates the four seasons of the year to enable the penguins to maintain their biorhythm. Visitors at the exhibit can observe birds flying underwater through a specially constructed viewing gallery, which has a 30 metre wide glass window.

Penguins are familiar to most of us through books and films. But, to see them in real, in a nearly realistic habitat, helps understand how penguins live. The mode of underwater feeding excites every student of biology. How do they see underwater? Do they keep their eyes open? How do they breathe? Such inquisitiveness or curiosity is aroused naturally, and consequently the quest – a prerequisite for every life science student – is generated.

Macaw and Cockatoo Courtyards

These are the 'welcome' birds at JBP, as they are located near the entrance foyer of the BirdPark. The Macaw, the king of the parrot family, is an exotic bird from South America. These South American birds have to be carefully observed to appreciate the diverse hues bird feathers have in nature. These birds were easily accessible to touch and photograph. Probably they develop a tolerance to humans.

Opposite the Macaw Courtyard are the cockatoos brought from Indonesia, Australia and Tasmania. They erect their crest during courtship and when irritated or excited. The Cockatoo Courtyard is landscaped to simulate grassland, open woodland and forest habitats to suit the different species of cockatoos.

Bird diversity, variations in colour, common behaviour patterns among similar groups, dimorphism in males and females are aspects of observation.



World of Darkness

The World of Darkness was opened in 1982. It is a nocturnal birdhouse. The nocturnal birds are put through a system of reversed lighting, which causes their biorhythm to be altered. Thus they are active during day enabling visitors to watch them. Here, visitors will get an impression that they are walking along a star-lit jungle path at night, watching the birds in their natural habitats as their haunting calls beckon. The Night Herons and Fish Owls are sighted in the mangrove swamps, the Snowy Owls on ice-capped mountains and the flightless kiwis in New Zealand forests.

The habits of nocturnal birds are easier to understand here. It is difficult to watch and study, say for example, the owls in nature. But within the confines, their night habits, especially mode of attacking prey becomes clear. For example, watching an owl from sighting a prey to swooping and capturing it, to preying can be observed in close range and detail.

Talking Birds Exhibit

This is situated near the main Panoram Station. There are at least 16 star birds, which include cockatoos and hill mynahs (a bird from India). Talking birds greet visitors with their varied vocabulary and antics. There is quite a cacophony of whistles, screeches and phrases which sound like 'hello', 'I love you', etc. These talking birds help visitors, especially children, develop an affinity for birds and kindle interest in them. Covering an area of 432 m², the exhibit also serves to educate pet owners on how to house and care for aviary birds. Here it is interesting to see children enticing the birds to recite numbers or sing 'Happy Birthday...'.


Woodpecker Exhibit

Here six species of woodpeckers are found. Visitors can listen to the *kut kut* sounds of the woodpeckers, as they knock on tree barks using their chisel-tipped beaks, in search of insects. On

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Waders have long legs and necks and they walk through water to find their food. Spoonbills, ibises, herons, plovers and stilts are examples of waders.

drilling a hole into the wood, they use their long tongues to catch insects inside the tree trunks. Ants and beetle grubs are favourite foods. Woodpeckers communicate with one another by 'drumming', a sound made by tapping the beak on a tree surface. These can also be heard and watched here. Not for a moment would one tend to think that there is anything unnatural about the whole thing, as the whole surroundings are woody with walk-in trails. The long tongue of the woodpecker can be appreciated as they stick it into the holes and withdraw an unsuspecting beetle grub.

Waders and Shorebirds Exhibit

Waders have long legs and necks and they walk through water to find their food. Spoonbills, ibises, herons, plovers and stilts are examples of waders. They depend on wetlands or swamps for their feeding and breeding. However, loss of wetlands due to pollution and drainage for agriculture and industrialization have caused a decline in the number of waders in the world. The Park's Wader exhibit has a wetland habitat and this has encouraged the Straw-necked Ibises and the endangered Scarlet Ibises to breed successfully here. At the Shorebirds exhibit, a wave simulator has been installed to create wave movements beating against the shoreline. The gulls, cormorants, oyster catchers and plovers have also found this to be a home and this has resulted in several of them breeding in the BirdPark. I have seen waders kept in captivity elsewhere look haggard and sick. But here with scientific feeding and excellent simulation of natural wetland, the birds tend to go through normal reproductive and life cycles. Foraging behaviour of waders, as they stalk through shallow water and strike at a crustacean, is interesting. Students on small-observational assignments will find this rewarding. Further, inter-specific chase, to avoid food competition becomes clear in different waders, and also explains why some species stay territorially clear of the other.

Crowned Pigeons Exhibit

Occupying an area of 640m², the Crowned Pigeons exhibit is



home to three species of Crowned Pigeons: Common Crowned Pigeon, Victoria Crowned Pigeon and Scheepmakers Crowned Pigeon. These fruit-eating pigeons are marked by their lacy crests, bluish-grey plumage and bright eyes with red irises. Crowned Pigeons are found in New Guinea and the neighbouring islands. They are found mostly on the ground and rarely take to flight. There is a shallow pit in the exhibit containing very fine sand that allows these pigeons to sandbath. Occasionally, the JBP authorities say, that visitors may be able to observe the unusual mating behaviour of the pigeons which is characterized by a loud 'whup-up, whup-up, whup-up' sound. A good view of the birds can also be enjoyed from the Panorail. Watching birds at the sand bath provides opportunities to study their anting behaviour (a behaviour by which birds pick live ants from soil and introduce them into their plumage, possibly as a pleasurable means of cleaning the feathers and skin).

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Southeast Asian Birds Aviary

Some of the world's most colourful birds come from Southeast Asia, which has about 12% of the world's avifauna. The Jurong BirdPark has a collection of about 260 Southeast Asian species. The Southeast Asian Birds Aviary is a showcase of the region's exotic and endangered species. The exhibit concentrates some 100 species of birds in a group of aviaries built under a series of A-framed structures. It has a large walk-in aviary in the centre, where birds fly freely. Tucked away at the bottom of the A-frames by the sides of the winding walkway, are 24 individual yet spacious aviaries that house endangered or territorial birds. The aviary has been landscaped to provide a simulated secondary rain forest environment.

As part of the rain forest experience, there is a tropical thunderstorm that comes on at 12 noon daily. The rain falls in the centre of the aviary away from the visitors walkway. This exhibit is especially attractive for tourists from temperate countries to admire the colourful tropical Southeast Asian birds. I found that birds have also become so habituated to humans that a



Hornbills are threatened in their natural habitats in tropical rain forests, including the Western Ghats in India.

Chloropsis came and sat on my shoulder for almost 20 seconds.

There is a guided tour of the aviary, available between 11.45 am and 3.45 pm, for those who require. Otherwise, the aviary is well labelled with drawing and charts detailing the birds original distribution. For a bird student from India, it is an excellent opportunity to get close to South-east Asian species and compare them with birds back home.

Hornbill and Toucan Exhibit

Hornbill – we have a nature magazine by that name published by the Bombay Natural History Society, India. These large birds can be seen in the park at a close range. Therefore, it is a nice opportunity to closely observe hornbill behaviour, as these birds in nature are arboreal, high on trees, and not easily amenable to behavioural (prolonged) studies. Covering an area of 2,000 m², the exhibit houses the world's largest collection of Southeast Asian hornbills and a wide variety of South American toucans. The 25 large aviaries measuring some 10 m in height have trees to simulate the birds natural habitat. These spacious aviaries provide a conducive environment for them to display their natural behaviour and also breed in captivity. Hornbills are threatened in their natural habitats in tropical rain forests, including the Western Ghats in India.

Therefore, it is one of the aims of Jurong BirdPark to try to breed these rare and endangered birds in captivity. According to the officials here, the BirdPark has experienced considerable success in breeding some of the species. In fact, the Park recorded the worlds first successful hatching of the Black Hornbill, Southern Pied Hornbill and Great Indian Hornbill in captivity.

At 11.45 am, everyday, one can get to enjoy the 'Hornbill Chit-Chat', which is a feeding time. In the bird show one also gets to see hornbill in action, proving that they are amenable to training.



Birds of Paradise

Birds of Paradise are shy, secretive birds, which can be found hiding in the tree-top or skulking in the undergrowth. Native to Papua New Guinea, these birds with iridescent plumes and wire-like projections have a elaborate courtship displays. This is an ideal place to get a first-hand idea of bird courtship; the elaborate displays, male to male rivalry, wooing of females, etc. give students rich experience in animal ethology. Further, the group courtship of these birds is a sight worth watching. The males would all stand together on a branch and move their wing and tail feathers almost in unison as part of the display. The female would then select a male from one of the dancing males. The Park has five of the 43 species of the Birds of Paradise in its collection. They are housed in five separate aviaries, which covers an area of 910 m².

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Flightless Birds Exhibit

The ostrich holds several world records in the bird kingdom – it is the fastest running bird, the largest living bird, which lays the largest egg. Together with birds like cassowary, rhea, emu, etc. ostriches are known as flightless birds. They are ‘running birds’ and cannot fly like other birds do. Visitors can observe these birds in eight paddocks at the Flightless Birds Exhibit. Each paddock has an open area landscaped like a scrub-land.



Rainbow parakeet (Trichoglossus haematodus). A colourful bird with long, narrow pointed tail. Found from East Indies and Australia to Vanatu. Has a distinct flight silhouette. (Photo: S Sridhar, ARPS)



Waterfall Aviary

This is the world's largest walk-in aviary, with the highest man-made waterfall according to JBP authorities. It is home for some 1,500 free-flying birds representing 80 African and South American species. Here one gets an opportunity to watch birds roost, bathe, feed and even raise their young in their nests. The park's steep hilly valley was seen more as a challenge than as a problem. It was then that the idea of a waterfall dawned.

Set in the valley, the aviary is landscaped with 10,000 exotic plants comprising 125 species of trees, bamboo, palms and ground-cover vegetation to simulate a tropical rain forest. In addition, an artificial 8 m tall tree moulded from an actual 100-year-old Barking Deer's Mango tree has also been erected to enhance the forest landscape. If experience is education then a study of tropical forests should ideally throw open many facets of ecology like food web, niche diversification, community structure, etc. Besides, a feel of the tropical forest is by itself a learning situation. A rustic suspension bridge offers a breathtaking view of the waterfall, while two observation posts at the top offer grand views of the aviary for detailed study.

Male Fairy Blue Bird (*Irena Puella*) an unmistakable bird with shining blue and velvety black plumage. The female has dull verditer-blue plumage. This conspicuous noisy and restless bird sings a mellow song from the canopy of the forest.

(Photo: S Sridhar, ARPS)



A special highlight in the aviary is the feeding programme. Regularly colourful flocks of Australasian parrots known as lorries – the only exception to the South American and African collection – descend to the feeding platform for food. It is interesting to watch bee-eaters (of Africa) and starlings feed on grass-hoppers, crickets, worms, which are released during feeding times. The insect chase is simply captivating. For a young student of ecology, observing these brings out vividly the aspects of trophic relationships and insectivory.

A special feature of JBP is the numerous feeding stations (one square feet wooden planks on stands). On these are trays with bird seeds/fruits and water. Besides, scattered on trees are kept cut papaya and banana bunches, etc. One can get quite close to birds, which are attracted to such feeding stations, especially for



photography. The Waterfall Aviary is accessible both by foot and the Panoramail train.

Lakes

The JBP has lake habitats, where a variety of water birds like swans, ducks, geese, cormorants and pelicans are found. Visitors will be naturally drawn to the pelicans because of their large bodies and long necks. They are fish-eaters and use the pouch, which hangs below their bill to catch food. The park has all the seven species of pelicans. Strikingly beautiful swans are also seen with the pelicans, besides ducks and teals. The Ringed Teal from South America is quite at home here. Visitors can view the lakes from the Observation Pavilion built-in structure, with bougainvillea outgrowth as cover, wooden benches and electric fans. These also serve as hides for a bird-watcher, for detailed observation and study.

Crane Paddock

These cranes have a special place at Jurong. The Chinese and Japanese, regard them as symbols of longevity, happiness, good luck and fidelity. There are 15 species of cranes in the world and all of them are endangered. With the exception of South America and Antarctica, cranes can be found on all the continents. The Park has 7 species of cranes housed in the Crane paddock, including the endangered White-naped Crane and East African Crowned Crane. Behind the display paddock are breeding aviaries, where pairs of cranes are housed. Breeding of cranes is important as the slow rate at which they reproduce coupled with man's invasion and destruction of their wetlands habitat, have resulted in the cranes becoming one of the rarest birds in the world.

The Parrot Paradise

The Parrot Paradise was opened as one of the highlights of the Park's Silver Jubilee celebrations. The Parrot Paradise, a one-hectare exhibit showcases more than 500 parrots from 110

Roller belongs to the Coraciidae family, comprising stout birds with big head, and long broad wings. Their name comes from the acrobatic courtship display of the male; tumbling in the air, while trying to attract the attention of a female.

(Photo: S Sridhar, ARPS)



Parrots are typically long-lived and some even live up to 50 years in captivity.

species. According to the authorities, it was built at a cost of \$2.5 million. The parrots were earlier scattered in the Park in individual aviaries. The Parrot Paradise was conceived from the idea of housing them under one roof for the convenience of the visitors. This is an ideal place to make a comparative study of behaviour of different pair of species.

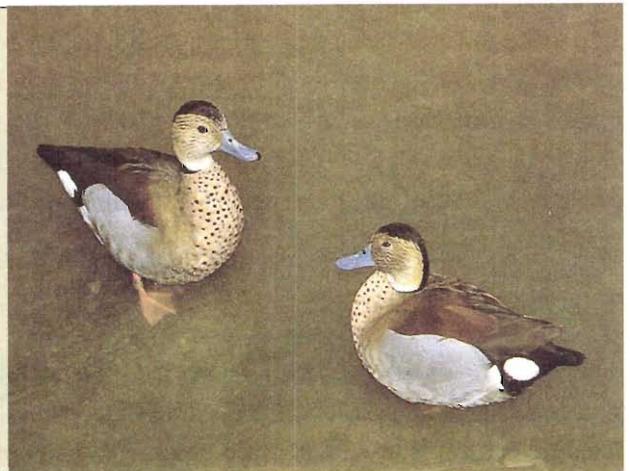
The 32 aviaries were designed to simulate to some extent the parrots' natural habitats with the help of beautiful hand-painted murals, as well as the natural vegetation, which included those of tropical rain forest, grasslands, semi-deserts, riverbanks, or rocky cliffs.

Parrots are typically long-lived and some even live up to 50 years in captivity. Many species have become extinct or are in danger of being so. This is the reason why special provisions have been made to encourage the breeding of parrots in captivity at the Parrot Paradise. So far, the Park has successfully bred 50 different species of the parrots in its collection.

The exhibit also has an interpretative pavilion, which provides interesting information on the display panels. It also houses a large, hollow, man-made tree where children can play and learn for themselves how parrots view the rest of the world from their nests in the hollows of tree trunks.

Ducks belong to the Anatidae family of 145 species. They are characterised by broad flattened bills, chunky bodies, pointed wing and webbed feet. In the face of continuous loss of habitat and hunting pressure many species of ducks are declining in numbers.

(Photo: S Sridhar, ARPS)



Endangered species bred at the BirdPark

Umbrella Cockatoo	Military Macaw
Jandaya Conure	Scarlet Macaw
Razor-billed Curassow	Bali Mynah
White-winged Wood Duck	Brown Fish Owl
Lesser Flamingo	Monk Parakeet
Caribbean Flamingo	Edward's Fig Parrot
Harris's Hawk	Pesquet's Parrot
Great Indian Hornbill	Dalmatian Pelican
Southern Pied Hornbill	Humboldt Penguin
Tarictic Hornbill	Scheepmaker's Crowned Pigeon
Scarlet Ibis	Nicobar Pigeon
Ornate Lory	Great Argus Pheasant
Purple-naped Lory	Palawan Peacock Pheasant
Hyacinth Macaw	White Spoonbill

Source: Jurong BirdPark, Singapore.

Breeding and Research: Captive Breeding and Resource Library

In recent times, habitat destruction, coupled with the capture of birds for trade, poaching, game and illegal bird trade have contributed to decline or extinction of birds. In the face of man's accelerating destruction of the environment, captive propagation is one of the practical methods of conservation to increase the bird population; especially those that are on the endangered list. To cater to this objective, the Breeding and Research Centre (BRC), was started in 1988. It has 110 breeding aviaries for individual pairs of birds, supported by a nerve centre with nurseries, laboratories, egg-incubation chambers and food preparation rooms.

The BRC also acts as a support facility for the breeding of birds in the display aviaries. Eggs and chicks that are abandoned by the parents are transferred to the nursery for incubation and



hand rearing. The BRC also keeps records of the birds' courtship display, parental neo-natal behaviour and nesting and breeding requirements. This information is vital to the Park's breeding programme and will also be useful to other aviarists and ornithologists as the Park hopes to become a centralised resource library on Southeast Asian bird species.

The account here may be treated as a model for a BirdPark. The information given under each head shows the variety of exhibits possible to make BirdPark both useful and interesting. The aspects of simulating habitats, like wave simulator for wading birds, reverse lighting for nocturnal birds, etc. are adoptable elsewhere, if, a BirdPark is to be planned. In addition, educative supplements like commentaries, recorded messages, interpretative notes, labels, and guides are worth integrating into the aviary. India should seriously plan for such model BirdPark to promote ornithological education and research.

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Once upon a time, physicists wondered whether light was an electromagnetic wave or a beam of particles. Quantum mechanics revealed that this question is simply not meaningful since neither answer is quite correct. Light, and all other forms of electromagnetic radiation, sometimes displays particle-like properties as photons, and sometimes behaves like a wave. The same is true for the electron which is particulate as it produces a flash of light on the TV screen and wave like as it passes through the electron microscope. In everyday life, when a pebble is thrown into a pond, the pebble is the particle and the ripple is the wave. In the quantum mechanical world, there is no such clear-cut distinction. The wave-particle duality is a universal attribute of materials systems.

Sheldon L Glashow
Higgins Professor of Physics at Harvard University
Interactions
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