

BIRD BANDER

Behaviour of the Male Satin Bower-bird at the Bower

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Observations of the male Satin Bower-bird (*Ptilonorhynchus violaceus*) at a bower in Leura, New South Wales, are presented. The bird under observation is considered to be promiscuous, with mating occurring either within the bower or on the platform. It is suggested that the adult male plays a considerable part in educating the young birds in bower building and display. The function of rudimentary bowers built by the young birds and the painting of bowers by adults are also discussed.

Introduction

In June 1965, a long-term study of the behaviour of the Satin Bower-bird, based on the observation of marked individuals was initiated at Leura, N.S.W. Between 15 June 1965 and 30 June 1968 a total of 600 individuals was banded in my garden. In addition to the numbered aluminium band each bird was given a different colour-combination by the use of celluloid colour-bands to allow subsequent observation without handling.

The plumage of the Satin Bower-bird is strikingly dimorphic in the adult and the fully mature male can be readily identified by its almost uniformly black colouration which is richly glossed with lilac-blue. The adult female has dull green upper-parts, creamy-yellow under-parts and brown wings and tail. The plumage of the immature birds of both sexes is similar to that of the adult female.

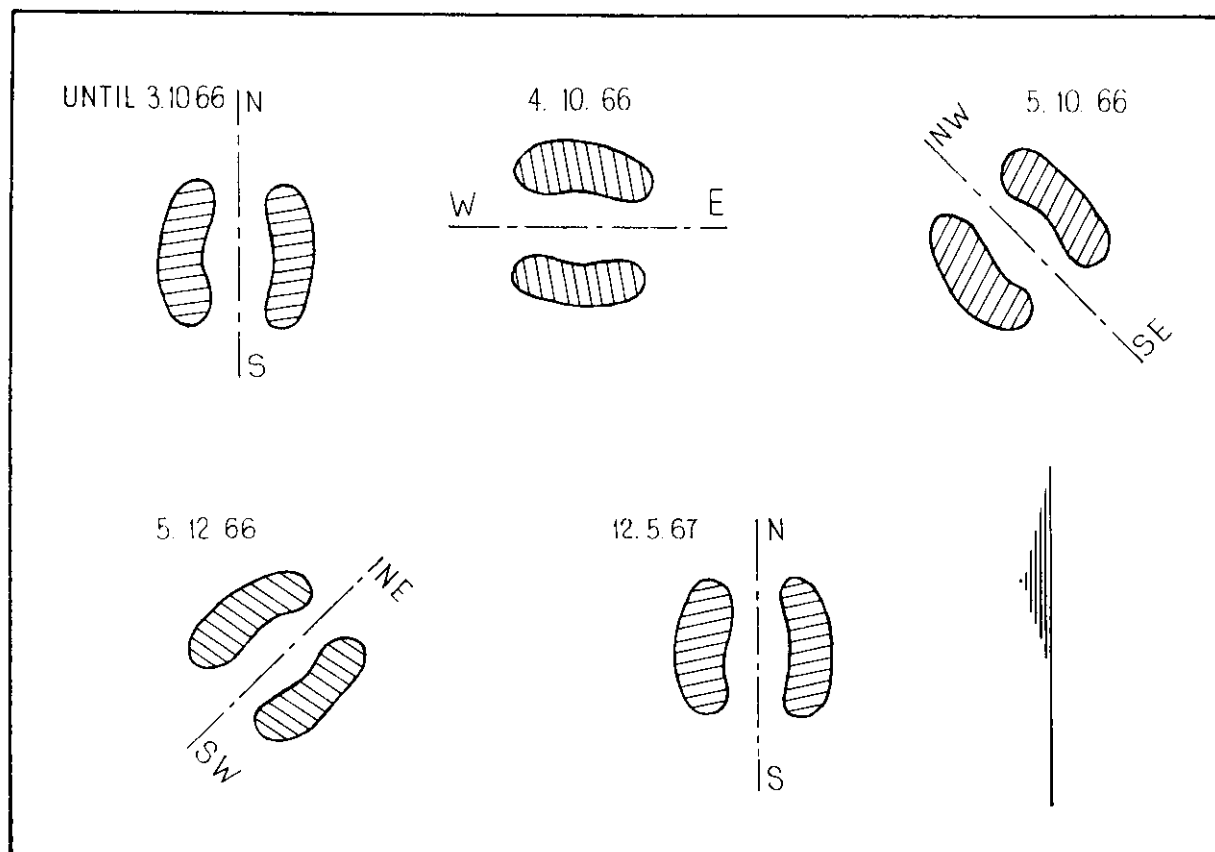
Method

From early August until the end of October 1967 daily visits were paid to the bower of an adult male, No. 85* except when the weather was very inclement, and on two occasions when my husband and I were away from home.

The bower was situated in a park half a mile from my garden, in which No. 85 had been banded on 13 July 1965 and to which he was a regular visitor.

Twice my husband and I kept an all day watch at the bower by alternating our visits of two or three hours each, from which it was established that most activities occurred in the morning. We therefore settled into the routine of one of us leaving home about 7 a.m. or earlier and staying at the bower until about 10.30 a.m. The other either undertook observations in the garden, or visited one of the rudimentary bowers nearby. In addition on some days visits were made at various times throughout the day.

* Colour combinations were applied in numerical order for recording purposes. No. 85 was banded 090-72195.



• Figure 1. Illustrating the changes in orientation of the bower.

Construction and Orientation of the Bower

The bower was situated in a secluded area of the park, sheltered by overhanging native shrubs, predominately Tea Tree (*Leptospermum scoparium*) with a higher canopy of eucalypts and exotic fir trees.

John Gould's description (1848) of a Satin Bower-bird's bower, fits this one exactly. Gould (Vol. 4) stated that—"The base consists of an extensive and rather convex platform of sticks firmly interwoven, on the centre of which the bower itself is built: this, like the platform on which it is placed, and with which it is interwoven, is formed of sticks and twigs, but of a more slender and flexible description, the tips of the twigs being so arranged as to curve inwards and nearly meet at the top: in the interior of the bower the materials are so placed that the

forks of the twigs are always presented outwards, by which arrangement not the slightest obstruction is offered to the passage of the birds".

The platform of the bower which we had under observation was four feet long (north-south), three feet wide (east-west), and two inches thick and was overlaid with dried reed-stems and grass of a straw colour. The bower was situated on the south-west area of the platform and when first inspected was orientated in a north-south direction. The walls and floor of the bower were nine inches long. The avenue was four inches wide at the northern entrance and five inches wide in the centre. The east wall was four inches thick and the western wall five inches thick. The height of the walls was ten inches. At the north side of the western wall, four inches away from it, two saplings were

growing through the platform, one was nine feet high and the other four feet high.

Decorating the platform, north and east of the bower we counted 75 blue plastic items (ball-point pen tops, plastic pegs, bottle tops, a toothbrush, and many parts of broken toys etc.), 15 blue-edged Crimson Rosella feathers, 10 dried snail shells, several pieces of fawn garden twine, and two blue marbles. Four long strands of blue wool were so placed as to lead into and along the avenue of the bower. Also decorating the platform were numerous dried *Banksia serrata* leaves and many creamy-green and blue flowers, pale brown onion skins, and other perishable items which were replaced every day during the mating season. Small ornaments especially *Billardiera scandens* flowers and other blue objects were lying on the floor of the bower.

The orientation of the bower did not always remain north-south (see Figure 1). On 4 October 1966 the bower had been rebuilt and lay parallel to the perching log, orientated in an east-west direction. The platform itself remained undisturbed except for some ornaments which had been redistributed about the new entrance to the bower. Next day, 5 October 1966, the orientation had again been changed, and the avenue was running NW.-SE. The bower remained in this position until 17 October 1966. We were away from 18 to 24 October, and the bower was still in the same position when we returned on 25 October, and remained so until 30 October 1966. We were again away until 15 November 1966, and on our return the bower was still orientated in a NW.-SE. direction, and remained so until 4 December 1966. On 5 December 1966, the orientation was changed to SW.-NE. and remained in this position during January, February, and March, 1967, during which time the bower was neglected. It was repaired early in April, but not redecorated, and the walls were thinly constructed. When inspected on 12 May 1967, it was back to its original position, running north-south.

On 26 June 1967, after a month of continuous rain, it was still orientated north-south. Twigs in the bower were sprouting green leaves after the rain. No flowers or fresh leaves had been added, but several new plastic ornaments were present. Old pen-tops and parrot feathers used last year were now buried under fresh straw. During the first week of July 1967, the bower was entirely rebuilt with fresh sticks, and remained orientated north-south throughout the 1967 breeding season.



• Male Satin Bower-bird adding a stick to the wall of the bower.

Photo: Ederic Slater

Seasonal Activities at the Bower

During early July some display took place, mostly arboreal, and gradually built up in intensity. Fresh flowers were placed on the bower on 8 and 10 July. During this period adult males and senior immature males displayed and called with many others watching, and our observations suggest that the young birds were being educated by the adults.

A. J. Marshall (1954) stated that the male Satin Bower-bird is physiologically prepared for mating much earlier in the season than is the female, and that the male attains sexual maturity while still in immature plumage. The behaviour we observed verified this, and it was during this time of waiting for the female to be ready to mate, that the instructional display took place. As the season advanced much of the activity

was centred about the main bower of the territory which was visited by many immature males.

At first these immature males watched, and sometimes approached, and even entered the bower without undue excitement, but by early September the adult male became very jealous and his tolerance of the immature male near his bower turned to aggression. Very violent display then took place.

Active arboreal and bower display commenced in early August and intensified throughout September and October. Mating occurred in the latter two months. This has varied somewhat in this district in the past, probably due to irregular flowering of banksias and eucalypts, and the destruction of heathland and forest by summer bushfires and winter burning-back, which, together with periods of drought, affect food supplies.

During 1967 we saw No. 85 mate with five different females, all of which were banded. A great number of unsuccessful matings with other females was also witnessed. The same female was not seen to return to the bower after mating although we did see females return when mating had not actually occurred. E. T. Gilliard (1963) suggested that most bower-building bower-birds are polygamous. However, the use of this term implies that a permanent bond exists between male and females, whereas our observations suggest this bond does not exist and that, at least in the Satin Bower-bird, the term promiscuous would be more appropriate.

Mating always occurred either inside the avenue of the bower, or occasionally in close proximity to it on the platform. Mating was never seen to take place at any other site. This, together with the maturing of senior immature male birds at this time, leads to very specialized behaviour on the part of the adult male. No. 85 guarded his bower continuously, and only left it in search of food when all was quiet. During the mating season he continually attempted to entice females to his bower as well as to destroy all other bowers in the territory that were sufficiently well constructed for mating to take place.

Females approached the bower very quietly and unobtrusively, and were frightened away by the male many times during courtship. Display to the female, although, done in an excited manner, was much quieter than the aggressive display to

other males. The male circled the avenue many times without entering it. The female sometimes arranged sticks in the avenue, or picked up the ornaments in her bill, always crouching, and sometimes even reached the stage of quivering her body and wings, only to be chased away.

On many occasions we saw the male display to a female who remained in the avenue for at least half an hour, only to be interrupted at the crucial stage either by the male apparently chasing her away, or by the intrusion of other birds. One or two immature birds, either male or female, were often seen in the fringe of the scrub nearby while the male was displaying to the female in the bower.

When mating did occur, the beating of the wings was so violent that the avenue was partly wrecked. The female seemed exhausted after mating, sometimes hardly able to leave and was only able to retreat a short distance to rest under cover of the underbush. If she remained too close she was chased away by the male, who then took no further notice of her and immediately commenced to repair the damaged bower, and then to preen himself.

Mating and all display activities continued whether or not the sun was shining on the bower, and mating was witnessed on both misty and fine mornings.

In order to check that the behaviour at this bower was not peculiar, we paid several visits to a bower belonging to an unbanded adult male at nearby Wentworth Falls. Although the concentration of birds was not so great we found the behaviour similar, with raids by immature males, and the chasing away of females ready to mate. Several of the immature birds visiting this bower had been banded previously in our garden.

On 15 November 1967 we noticed that No. 85 was sick. He was fluffed up and did not leave our garden. We inspected his bower and found it completely demolished. All the sticks had been removed and we could not find them. The platform was in disarray and many ornaments were missing. On 26 November he seemed much better and moved away from the garden for short periods. On 28 November he left the garden and we inspected the bower in the afternoon finding it completely rebuilt in a north-south orientation, with him in attendance. It is of interest to note the fact that this bower was demolished when the bird was apparently too sick to protect it.



• Female Satin Bower-bird on nest.

Photo: N. Chaffer

Although most birds dispersed from the vicinity of other bowers in this district during November and remained dispersed until July the following year, some adult males remained. Occasionally immature males returned for short visits during the summer.

If an adult remained resident throughout the summer he did not destroy his bower, but neglected it, and it fell into disrepair. Plastic ornaments, which comprise the greater part of the blue decorations, did not deteriorate, but were washed clean by rain, and so the bowers often looked bright when not in use. We have evidence to suggest that two adult males who left for the summer dismantled their bowers before leaving.

Rudimentary Bowlers

Although his bower was half a mile away, No. 85 considered our garden to be part of his territory, and during the mating season, would not allow other adult males into it. On the occasion of such visits actual physical combat took place, often in flight. The intruders were always defeated, and did not return until the following year, except for hurried raids.

The immature males, however, were not driven away, and from August through to October they built, maintained, and displayed at a series of bowers in various stages of perfection. One platform, and one nearly complete bower, were built in our garden and we were able to observe them closely. Four others were in close proximity.

The behaviour at these rudimentary bowers has led me to believe that the male Satin Bower-bird does not altogether inherit his ability to build a bower and display in the manner that he eventually does and that these skills are perfected only after years of practice.

Young birds, in their first and second years, took a great interest in all proceedings, and gathered in small groups in a tree near a suitable location for a bower. Their first attempt at building was confined to making a platform. They gathered a few sticks, much thicker than those used by experienced birds, and placed them in a circular arrangement on the ground. Some birds watched while others played with the sticks, often taking turns at these activities, indulging in a great deal of noisy terrestrial and arboreal display. Gradually the platform grew until at the end of the season it was some 2½ feet in diameter and 2 inches thick.

There were always older immature male birds about, and sometimes one would fly down and place a few sticks in an upright position, sticking them into the platform in an interlocking cradle fashion. This crossed interlocking arrangement of sticks is the foundation of every avenue, and it is extremely strong and durable. Occasionally almost a full bower would be constructed on the site, only to be pulled down an hour or so later.

Meanwhile, not far away, practice bowers were being built by other birds. These were in various stages of perfection, but none was made of such fine sticks, or was as large and well made as an adult male's bower. The construction of these bowers was often very quick. One was built near our house one morning during our absence of 2½ hours. It was later pulled to pieces and rebuilt many times.

This bower belonged to three or four immature birds which had acquired light coloured bills typical of an adult male, although they were still in green plumage. At this age they had become quite proficient builders. Six or more birds were always in attendance and the bower was used for some six weeks. Each bird took turns at placing sticks in position and this was done with much ceremony, often the stick being rearranged several times. Many younger birds tried their hand at this when the older birds were absent. Some were not able to build at first and would place sticks out of position. I watched one bird pick up an eight inch stick and try to turn round and upend it so as to place it in position. At each attempt the end hit an obstruction and the bird could not turn with it. He did not discover that by turning in the opposite direction or lifting his head a little higher he could have placed the stick without interference. After five tries he dropped the stick and searched for another.

We have never seen mating by immature male birds in green plumage, even though the rudimentary bower near our window was under almost constant observation when in use. Females often visited it and remained about it while the immature males displayed to them for long periods. Not once did an immature male chase a female away. One female, No. 337, was seen near this bower for several days before mating with No. 85 at his bower.

Painting

The avenue under observation was always painted with green liverwort (*Lunularia* sp.) which No. 85 deposited in a wet lump near the far end of the avenue. During a painting session he returned several times to this material, chewing it up and mixing it with saliva, and then applying it to the inside of the avenue walls with a nibbling action. A great deal of saliva was used, and when the morning sun shone on the bower, the moisture could be seen running down the sticks.

On two occasions during the mating season I saw immature males (two different birds) enter the avenue of No. 85's bower in his absence and paint. Each time the intruder first re-arranged a few sticks and then commenced to paint. Only saliva, without any foreign material, was used. On the first occasion painting continued for 10 minutes and on the second occasion about 7 minutes. Each time No. 85 returned like a bolt of lightning, streaking into the avenue after the trespasser, who departed in extraordinary haste. On each occasion, after making sure the intruder had gone, No. 85 returned to the avenue and thoroughly painted over the area where the other bird had painted, using liverwort with saliva. The repainting seemed to be done in a mood of considerable agitation and anger.

Raiding of Bowers

During the mating season No. 85 left his bower only when all was quiet about it, in order to fly direct to our garden for food. After feeding quickly he would visit each rudimentary platform and bower in turn, stealing every flower and ornament, and stuffing his bill as full as he could with treasures. He often made several trips back to his bower. (Some young birds are not as selective in the colours blue, creamy-green, and onion-skin brown as the older birds, and No. 85 did not steal anything that was off colour). While the owners stood by passively, he would then savagely wreck the better constructed avenues by digging his feet into the platform and dragging the avenue apart with his bill, and steal any sticks that were fine enough for his own use. He sometimes mildly attacked them before leaving, but they did not attack him. Satisfied that these bowers were in ruins, No. 85 then called loudly in nearby places in an effort (often successful) to entice females back to his bower. When he had departed the



• Male Satin Bower-bird with ornaments in his bill, displaying to the female at the bower.

Photo: Ederic Slater

immature birds immediately began to rebuild.

Many counter raids occurred. The immature birds would gang-up and swoop on No. 85's bower. This was when display was most frantic. No. 85's eyes became red and bulged in his head. He would then pick up two objects, one blue and one cream, in his bill, and prance in circles, defending in all directions. Sometimes a rival adult male would join in the raid, and I have seen intruders sweep through the avenue. They never took possession of the bower, for No. 85 always stood his ground, although they always snatched some ornament from the platform. They then usually retired to a nearby tree, and in their turn, the immature males enticed waiting females away. Raiding adult males at this time were chased away by No. 85.

Special treasures sometimes changed from this bower to rudimentary bowers several times a day. A blue celluloid leg band which I threw out in the garden was much prized. It was the favourite

blue colour and could easily be held in the bill for display. After going back and forth to a rudimentary bower for several days, it was eventually woven into the inner wall of No. 85's bower with a stick through the ring. A parrot feather to which I attached a piece of blue tinsel, was first taken by an immature bird and placed on his bower. No. 85 stole it and it was on his platform for several days. Later I saw it on another adult male's bower at Wentworth Falls, two miles away.

Discussion

As mating takes place at the bower or in the immediate vicinity, it is evident that bower building, decorating, painting and display is a form of extremely specialized courtship behaviour. It is surprising that so few reports of mating of this species have been published to date. Norman Chaffer (1959) recorded mating at a bower as witnessed by Ellis McNamara, and also three

matings which he witnessed and photographed. Two of the latter occurred on the same day, and it is mentioned that on the first occasion the female seemed nervous of the hide, and that mating took place about 8 feet away, whilst the second took no notice of the hide and mating was in the bower. The third copulation recorded by Chaffer (p. 301) was one year later and was 10 feet away from the bower. Possibly this bird was also nervous of the hide. Four matings witnessed by us took place in the bower, whilst the fifth was on the platform close to the avenue. We do not use a hide, but are able to sit quite close to the bower concealed by thin foliage. From this it would seem that if the female cannot be induced into the bower, mating will occur in close proximity to it. I have been unable to find any record of mating elsewhere.

Although Chaffer (p. 300) recorded two matings on the same day, he does not suggest that they were different females. The varied behaviour (on the first occasion the female appeared nervous of the hide, but later in the day took no notice of it) suggests that these may have been two different birds. Marshall (1954) states—"It is difficult to believe that the astonishing display elaborations of the male Satin-bird give him no greater number of mates, and probably a less number of offspring (one, or two, rarely three) than are achieved by the most drab fly-catcher or scrub-wren sharing his territory". That Marshall had in mind that the bird was either promiscuous or polygamous is quite evident by this statement and subsequent text. However he had no proof of this.

When reviewing our records of the behaviour of No. 85 at his bower, it would seem that the bird is promiscuous rather than polygamous. In addition to the five matings witnessed during the season under review at least ten courtships with identified females occurred at the bower which did not terminate with copulation. Although some females return to our garden each year, we have to date only witnessed the mating of No. 85 with one female (No. 337) in two consecutive years. We believe that No. 85 will mate with every mature female that he can entice to his bower. Careful records of future breeding seasons will be kept to prove or disprove this.

On the basis of our observations it appears that the adult male plays a considerable part in educating the young male in bower building and display. Whether this is intentional or whether the curiosity of the immature birds induces them

to continually watch the performance is not known, but immature male birds certainly are tolerated and are displayed to outside the mating season. The older immature males also display to the younger immature males, and during June and July parties of immature males accompanied by adult males are often seen.

Immature birds are sometimes displayed to at principal bowers very early in the season, and are frequently seen near these bowers during courtship. Chaffer (1969, p. 299) mentioned that on two occasions a second green bird accompanied a female to the male's bower, and again during another visit three green birds were nearby in bushes. He further stated—"The second green bird could have been a young male, and the intentness with which it watched the display gave one the impression that it was receiving a lesson."

The behaviour at rudimentary bowers has produced much evidence that the young bird must learn to build a bower, and does not altogether inherit the ability to do so. However the fact that every adult male builds his bower exactly to the same pattern, the only difference being perhaps in size, must indicate that the bird has an inborn urge to act in this manner. In order to prove the extent of this inborn urge it would be helpful to rear a chick apart from its species. Marshall, I have been told, hoped to do this.

The painting of bowers of Satin Bower-birds was first noticed by E. Nubling (1921), and although he mentions that the male (p. 13) "might be seen . . . nibbling at some brownish substance attached to his bill", his observation of the bird painting the bower seems not to have been published at the time. However, A. H. Chisholm (1924) states that this procedure "had been brought to notice by Mr E. Nubling". Chisholm further states "The dye drying flat, resembled soot or the aftermath of fires." Later Nubling (1939) and P. A. Gilbert (1939a) observed the use of the fruit of the Paroo Lily (*Dianella caerulea*), Blue-berry Ash (*Elaeocarpus cyaneus*), Native Plum (*Sideroxylon australe*), and several species of Geebungs (*Persoonia* spp.). Marshall (1954) reported that in the London Zoo one bird nibbled the soft wood from a sieve, and G. R. Gannon (1930) reported charcoal as having been used many times. Chaffer (1931) reported that fibrous bark and blue-gum bark were frequently used as 'brushes' for painting

the bower. Blue-bags (bleach) have also been used occasionally (Marshall, 1932).

The function of the painting habit in bower-birds has caused some speculation. Nubling (1939) suggested that it might be purely aesthetic, and Marshall (1954) suggested that it might be a substitution activity for courtship feeding. As another possible explanation, our observations lead us to suggest that the materials used for painting, when masticated with the bird's saliva, may provide identification of the owner, visually or olfactorily. However, as the nostrils of the Satin Bower-bird are situated at the top of the bill and are covered with feathers, it would be considered unlikely that the bird's sense of smell is one of importance. Whether there is sufficient variation of the materials used for painting to supply visual identification, or if the saliva has an individual character, needs further research.

Nevertheless, with our continued watching of the bird painting his bower, we are convinced that painting is a most important function in the courtship cycle, and that identification of ownership plays a large part in this procedure. The clandestine painting of the bower by two immature birds which I witnessed, when only saliva was used, and the thorough overpaint with liverwort by No. 85 may be significant. We have never seen an immature male paint a communal rudimentary bower. In addition, the ritual of No. 85's preparation of the bower in the early morning, which always included bringing a fresh supply of liverwort, and again painting the bower with liverwort and saliva when it was repaired after use during the day, impresses us as being of great importance. It was not until this was completed that No. 85 flew to his look-out and calling perch (high up in a tree), and loudly called his mating call for females. The excessive flow of saliva during painting could also indicate a sensual reaction.

Conclusion

This study was attempted as an amateur project and I had no preconceived ideas concerning it. As it progressed I commenced to delve into available literature, and found that some ideas formulated in my mind as a result of our observations had been vaguely hinted at by others, but had not been elaborated on because of lack of proof.

The value of systematic colour-banding as an ornithological technique can be readily seen from these observations. Without this technique the large number of birds involved would not have

been apparent, and the relationship within the group could not have been documented. Neither could we have successfully put the immature male birds into their "known" age groups without positive identification of retrapped birds. Some early observations, such as those recorded by Nubling (1939) and Gilbert (1928 and 1939b) may have been misinterpreted, as they were made with unmarked birds.

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