The walls of the *Bâda* rise straight up, and from the *Bâda* rises the curvilinear tower. The walls of the Dorians used to be built with a slight inward slant; the Uriyas resembled the Ionians in this respect, who made their walls perfectly vertical.

I have dwelt at great length on the details of a *Bâda* or cube of an Orissa, temple. I shall now pass on to the tower.

In a Rekha Dewl, as I have already stated, the tower is curvilinear, and in Pida Dewl, it is pyramidal.

In an ordinary temple, the tower rises from the edge of the *Bâda*, but in large ones there is a recess or set back of about two inches. The tower rising in courses slopes upwards very gradually by an imperceptible diminution of projections. The last course of stones is called the *Ghâd Chakdâ*, (Plate. II) or the shoulder course. The curvilinear tower just below the shoulder course has half the width of the *Bâda*. The pyramidal tower of a Pida Dewl has also the shoulder course; over it is the cylindrical portion called Beki or neck.

The plate. II. illustrates in detail the different parts from *Ghâd Chakdâ* to the top of the pinnacle.

The Beki is the cylindrical portion just above the shoulder course resembling the neck of human physiognomy. The portion above the Beki resembles the head of a human body, and that below reaching up to the *Bâda* is, as it were, the trunk of the temple. Above the Beki is the *Amlâ Sree*,

resembling *Amlaki*, as far as its ribbed surface is concerned, but more flattened than the natural berry.

In the space between the *Amlâ Sree* and shoulder course are placed at regular intervals four female figures called Dewl Charani or the mistress, or custodian of the temple. These are placed just over the R*a*h*a*p*a*gas or central pilasters, and hence point to the four cardinal points of the compass. In the four corners of this recess are placed the figures of lions. The haunches of two lions placed back to back meeting in each corner end in a single head ; these are technically called Düpichh*a* Sinha.

Over the *A*mlâ rests a short cylindrical portion called Tripatadh*a*ra, supporting the Karpüri, the outlines of which resemble an umbrella. A vertical section drawn through Karpüri would look like a trapezium with the slant sides replaced by cyma reversa, the curvature of which is much flattened.

From the top of Karpüri commences the Kalasa with its pedestal.

I give below *ad seriatim* the details of Kalasa from Kalasap*a*da or base of finial upwards.

(1) Kalasap*a*da—a cylindrical portion surmounted by a segment of sphere having a short height. (c of plate III).

(2) Kalasap*a*da Dori—It is a moulding separating the Kalasap*a*da from the Kalasa proper.

(3) Kalasa—with a moulding in the centre resembling a bead and running round it. (b of plate III).

(4) Kalasa Beki—the neck of Kalasa.

(5) Tripatadhara.

(6) Kalasa Karpüri.

(7) Ghadi—resembling a pitcher. (a of plate III).

Over the Ghadi is the trident or the discus as the case may be.

I give below the proportions of the above in case of a *Pida dewl.*

The diameter of Beki is half the maximum breadth of Ghad Chakda. The diameter of the moulding above it is that of the Beki added to ¼ its height (i. e. of Beki).

The diameter of the Sree must be ascertained by drawing lines ftom the extreme ends of the *pidas* to the *kalasapâda* (vide plate III). The diameter of *kalasa* in the centre should be equal to the height of the *kalasa* measured from its base to the bottom of the *karpüri* above it.

The diameter of *karpüri* above *kalasa* should be half of the height of *kalasa* from its base to the bottom of *karpüri.*

The height of the *pidas* depends upon the number chosen ; an odd number of them is usually employed as 3, 5, 7, etc. ; I have, however, noticed deviations in several cases.

The height of the *pidas* taken together including the *ghâdchakdâ* and forming a frustum of pyramid is usually ¾ the height of the *bâda* ; the height of the portion from the top of *ghâdchakdâ* to the base of *kalasa* or finial is usually ¾ the frustum of pyramid already referred to.

(a) The *Beki* = ½ the last *pida* with *ghâdchakdâ*.

(b) The *Sree* = 1½ *Beki*

(c) The *Tripataahâra* = ¼ *Sree*

(d) The *Karpüri* above *Sree* = ¾ *Sree*

(e) The *dori* above *karpuri* = *Tripatadhâra*

(f) The *Sejüpatrapâkhudâ* = ¾ *Sree*

(g) The *Beki* below *Amlâ* = ¼ of *(f)*

(h) The *Amlâ* = ¾ *(f)*

(i) The *Karpüri* of *Amlâ* = ½ of *(h)*

(j) The *Kalasapâda* = ½ *(i)*

(k) The *dori* in the middle of *kalasa* should be as high as the base of the *kalasa*.

The breadth of the *ghâdchakdâ* should be equal to the height of the *pidas* taken together.

The *pida* should project beyond the *bâda* or the cubical portion by a length equal to half the height of the upper *Janghâ*.

The proportions are a little different in a Rekha dewl, and are as follow.

The height of the *Amlâ* should be twice that of *Beki*; the height of *karpüri* above *Amlâ* should be the same as that of *Beki*; that of *Kalaspâda* is ½ of *karpüri*; the *kalasa* should be the same as in the case of a *Pıda dewl.* I have fixed the above proportions by studying numerous cases; the above proportions are tabulated in the following list.

Beki = *Amlaka Silâ*

Tripatadhâra = ⅓ *Amlaka Silâ.*

Amlaka Silâ = *Amlâ karpüri.*

Kalasapâda-dori = ⅙ *kalasa-handi.*

Kalasa dori = ¼ *kalasa-handi.*

Kalasa Beki = ¼ *kalasa-handi.*

Tripatadhâra = *kalasa beki.*

Kalasa (including *dori* but including *ghadi*) = 1¾ Amlâ.

The maximum width of the *kalasa-handi* = ½ the height of *kalasa* including *pâda* and *dori.*

On referring to Plate II. it will be seen that the portion of the Rekha in the prolongation of the *konakapâga* is divided into certain portions separated from one another by *Amlaka Silâ*; these divisions are called *Bhümis* or planes; in the sketch referred to, I have shown five *bhümis*; a temple having some pretension to importance usually contains ten such *bhümis* (vide plate—XVII); the heights of these divisions are not equal; their relative proportions are given below.

First *Bhûmi* = ¾ the width or length of *konakapâga*
Second ,, = ¾ of the first *bhûmi*.
Third ,, = ¾ of the second *bhûmi*.
Fourth ,, = ¾ of the third *bhûmi*.
&c, &c, &c.

Thus we see that the heights of the *Bhûmis* form a geometrical series, having ¾ as the common multiple.

In the *Anarthapâga* above the *bâda* are (usually) seen representations of *rekhadewl* with intervening projections of *kani*, and *basanta*, the *rekhadewls* diminishing in size as the *ghâdchakdâ* or the topping course is reached (vide plate II.) ; exceptions are, however, noticed in the temples of Muktesvara, Parasûramesvara, Vaital. There are deep vertical recesses noticeable between the *pâgas* ; but in some cases, as in the temple of Muktesvara, the recess between the *konakapâga* and *anarthapâga* is carved with panels at regular intervals containing female figures.

The *râhâpâga* above *bâda* consists of plain horizontal projections, the face of which is usually carved ; just above the *bâda*, the figure of lion projects, and over this is noticed an ornamental device consisting of concentric circles, the outermost member of which has the curve divided and the ends turned up into spirals ; these circles are often flattened, and are hence more or less elliptical, and they are in many cases found

to be eccentric. These circles are flanked by reclining human figures, and resemble, when taken together, a representation of the armorial insignia. The whole ornamental device is technically called Bho or भो, and is classified as per the details in the innermost circle; as an illustration, if it contains the figure of lotus, it is called Padma Bho (पद्म भो), if that of Narayana, it is called Narayana Bho, as on the eastern face of the Vaital dewl, etc. The height of the Bho is nearly equal to the *janghâ*, or the first element of the *bâda*; over the Bho, is noticed the figure of lion resting on an elephant on a slab of stone and projecting from the *râhâpâga*; higher up on the *râhâpâga* on the side facing the Jagamohana is seen a huge lion projecting from the *rekha*, and floating, as it were, in the mid-air; it is situated at half the height of the *rekha* from the *bâda* to the *kalasa* or finial.

In some cases, the *râhâpâga* is formed by representations of *rekha dewls* receding back from one another, and at different heights; the Rajarani temple is a nice illustration of this (vide plate XIV); in these cases the *dewl* is called a *rekha pancha-mundi dewl*, or a *rekha dewl* having five pinnacles, viz., one central and four on the sides.

Height. The height of a *rekha dewl* is generally 2½ the length of the *bâda* measured between the *râhâpâgas* or central pilasters. In very few cases, however, the height be-

comes three times the length. I have carefully measured the heights of several temples promiscuously, and have deduced therefrom the following proportions. The measurements are given below in round numbers.

	Length.	Height.	Proportion.
Müktesvara temple ...	15′	34′	2·3
Rajarani temple ...	17′	46′	2·7
Temple of Jagannath at Puri.	80′	209′*	2·6
Ananta Vasüdeva temple	22′	60′	2·7

In the case of the temple of Siddhesvara the proportion rises to 3 ; and strangely, in the case of the great Lingaraja, at Bhubanesvara, the proportion becomes less than 2.

Generally speaking, it may be asserted that in the case of Orissan temples, the height of the Vimana bears a ratio of 2·5 to the length of the base; this ratio has been recommended in the Agni Puranam ; there the ratio has been made to range between 2 and 3.†

It may be mentioned here that the classification of the temples into five classes as quoted by Ram Raz from Kasyapa in his treatise on the "Architecture of the Hindus" does not

* This height is recorded with reference to the ground level of the Uttara Parsva Math on the courtyard of which the theodolite was set up. This is at a lower level than the quadrangle of the temple, which again starts from a plinth ; hence the proportion in column 4 comes down to 2·5.

† Agni Puranam, 225th Chapter.

hold good in this part of India ; that classification is, I believe, applicable in the Deccan.*

The rules of the Agni Pur*a*nam were followed in Orissa as far as practicable in those days. In the Brihat Samhit*a*, the ratio has been fixed at 2. This ratio is not found to obtain in practice in Orissa in the Mediæval times.

I have already remarked that the *bâda* of a *rekha dewl* is either a cube or a rectangular parallelopiped. The temple of Siddhesvara may be cited as an example of the first case ; for the length, breadth, and height of the *bâda* are 16 feet each, and hence it is a veritable cube. On working out the ratio borne by the height to the length of the *bâda* in many cases, I have seen that it ranges between ·65 to ·72. I give below the following figures in a tabular form.

	Length of *bâda.*	Height of *bâda.*	Ratio.
Ananta V*â*südeva ...	22′-1″	16′-1″	·72
Paras*ü*r*a*mesvara ...	19′-9″	14′-3″	·72
Müktesvara ...	15′	10′-9″	·71
Vait*a*l	20′	13′-11″	·70
Vim*a*na of Lingar*a*ja ...	66′	43′-5½″	·66

* It may be mentioned here incidentally that on referring to the book by Ram Raz, it appears that the proportions quoted by Dr. Mitra in the foot-note of page 57, Indo-Aryans, Vol. I. are incorrect. Dr. Rajendra Lal, I believe, took those proportions from General Cunningham, and not from the text itself.

It may be stated here that by the term "height of the *bâda*" the external height is meant ; the internal height of a *bâda* is less than the external one, for internal corbelling or bracketting commences at a less height inside than outside.

The height of a *rekha dewl* exclusive of the *kalasa* or finial is usually three times the height of the *bâda*.

Names.	Height of *bâda*.	Height of the Rekha dewl exclusive of Kalasa.	Ratio.
Müktesvara temple	10′-9″	31′	3 (app.)
Siddhesvara temple	16′	47′	3 ,,
Lingaraja at Bhubanesvara.	43′-5″	127′-1	3 ,,

Regarding the height of the Lingaraja without the *kalasa* it may be stated that the theodolite was set up in the compound of the local school to the south of the temple ; the height of the temple may, for all practical purposes, be taken as three times the height of the *bâda*, for there is a discrepancy of 2 or 3 ft. only in respect of the calculated height according to the Brihat Samhita. From my professional experience of buildings in Calcutta, I have carefully noticed that in 95 per cent. of cases the deviation in height from the sanctioned plans is about 1 ft

in an average two-storeyed building of 24 ft. in height; according to this rate the modern architects in constructing a building as high as the temple at Bhubanesvara would have a tendency to exceed the theoretical height by about 5'-6"; this difficulty will be aggravated in a building which is curvilinear in section, has constructive peculiarities, and in which stone is used as the building material; hence it may be reasonably stated that in the case of the temple of Lingaraja, the modern architects would exceed the height by 10 to 11 ft.; and this will happen in an age when harsh Municipal laws act in all their rigour to enforce conformity to sanctioned plans.

The rule laid down in Brihat Samhita is that the height of a temple should be three times the perpendicular height of the rectangular portion*; and the above figures in the tabular form will prove that the rule of Brihat Samhita has been strictly followed.

Vaital Dewl.

There is another style prevalent in the Puri district which is distinctly exotic in origin; a temple of this style is called a Vaital Dewl (Vide plates XVIII, XIX). This style was imported from the south, and it is rather difficult to detect the exact type of which it forms the counterpart. On a careful examination of this style, I have come to the conclusion

* "उच्छ्रायाद्यस्तृतीयोऽंशस्तेन तुल्या तिर्भवेत्" ॥ ११

वराहसंहितायां प्रासादलक्षणं नाम षट्पञ्चाशत्तमोऽध्यायः ॥

that it bears a close affinity to the *rathas* of Mahavellipore, the earliest date of which can be assigned to the fourth century A. D. The crowning member, at least, of the Vaital bears a resemblance to the latter in a remarkable degree. On referring to plate XVIII. it will be seen that the top of the temple is a semi-cylinder showing a semi-ellipse in end elevation ; this is surmounted by three crowning elements consisting of *Amlaka, Karpuri, Kalasa*, &c. as in the case of an ordinary *Rekha Dewl.* The plates XVIII & XIX clearly indicate that there is a break in the continuity of the *rekha* portion of the tower effected by means of a recess which resembles the neck of human physiognomy, and hence the semi-cylindrical crowning member has been styled *mastaka* or head of the structure ; it is solid in construction. The portion below the recess referred to does not resemble exactly the *rekha* ending in *ghâd chakdâ* already explained. The *rekha* of plate XIX is nearly similar to the *mastaka* in general appearance. The *mastaka* (Plate XIX) is technically called *Vaitâ*, and hence the name of the *dewl.* The term *Vaitâ* is probably a contraction of the Sanskrit word Vahitra which means a sea-going vessel or a ship. The external appearance of the *mastaka* is similar to the hull of a ship reversed, and with the ends removed by planes at right angles to the longitudinal axis. The three crowning members resemble the masts of a

ship. The *rathas* of Mahavellipore from which this style has been derived are also provided with similar finials crowning the main structure.

The *mastaka* might probably have been derived from the fruit *Vaitâ*, a sort of pumpkin gourd, or more properly *Vaitâ—kakhâru*, much relished by the people of Orissa as is evidenced by the adage quoted below * Whatever be the derivation of the term there is not the least doubt that this style is indicative of a decided Dravidian origin manifested in the general outline and sculpture of the structure, described in Chapter VIII. In this style the *pâgas* or pilasters are not prominent, and the temple described in chapter VIII is, therefore, *Ekaratha* or *Chaurasa* or square or rectangular in ground plan.

There is, however, still another class of Orissan style which is rather a non-descript. I have explained its details in chapter VIII ; it is called *Gaurichâra*, the name being evidently derived from Gauri, a goddess enshrined in a temple of this style ; the plate XI, however, shows the present temple of Gauri Devi after the restoration of the roof which was in a dilapidated condition.

Gauri Chara Dewl.

The selection of site is a very important item in the construction of temples ; the soil is very carefully examined before the site is approved of. In the Agni-Puranam,

Selection of site.

वैता कखारु मजा काहिकि पछारु

240th. chapter, I have come across a few rules to be observed in the selection of a site. The soil, according to its quality is assigned to the Br*a*hmins, Kshatriyas, Vaisyas, and *S*üdras respectively ; and this classification is based on the colour of the soil, and the scent emitted by it ; from the description given, I judge the soil assigned to the Br*a*hmins to be loamy in character, those to the Kshatriyas and Vaisyas to be ferruginous, that of the former being evidently more rocky ; the soil assigned to the *S*üdras is the worst of all, being black cotton soil, perhaps oozy, and "emitting the smell of wine". In the Agni-Pur*a*nam, the soil filled up with bones, ashes has been forbidden to be selected as a suitable site for a building. The reason is not far to seek ; for a soil made up of these things never attains the solidity or homogeneity necessary for the base of a structure ; I have seen the tanks filled up by ashes or some such things when dug up after 30 years of their filling in present the same original condition of the contents without any consolidation or homogeneity being effected. The Agni-Pur*a*nam has prescribed many religious ceremonies to be performed at the time of selecting a site with which we are not concerned.

Ram Raz has quoted a rule from the K*as*yapa which is very ingenious in ascertaining the suitability of the ground to be used as a site. I quote the rule below. "Having dug

a pit a *hasta* (cubic) in depth, in the middle of the ground return the earth into it, and according to the space which the latter may now take up with reference to that which it occupied before the digging of the pit, whether more, less, or the same, the ground should be considered as good, bad, or indifferent; the good and indifferent sorts are acceptable, but the bad should by all means be avoided."*

I have come across an exactly similar passage in the Matsya Puranam.

The rule quoted above does not require any elucidation; it has been observed by all that the earth taken out of a solid and homogeneous plot of land has greater cubical contents than the pit or hole from which it is dug out; the prohibition by the Agni Puranam of the soil filled up with ashes, &c. is noticed in this text in a nut-shell.

Direction.

The next point in the Architecture of the Orissan temples is the determination of the cardinal points of the compass. The temples of Orissa usually face the east, so that the observer looking at the image will have his face turned towards the west. There are some temples, however, which form exceptions to the general rule, *e. g.*, Muktesvara, Parasuramesvara, etc. The builders of the temple are found to punctiliously observe the rule regarding direction. I have seen

* Ram Raz. The Architecture of the Hindus, p. 17.

that this practice is often followed now; while at Konarka, I made a careful survey of the temple with the prismatic compass and theodolite, and fouud that the deviation from the true north was so very slight that it might be neglected. A greater error is nowadays committed by a practical surveyor having accurate mathematical instruments to work with. I give below the data collected by me.

The magnetic bearing of the eastern doorway of the Jagamohana determined several times lies between 359°-45′ and 1°-15′; it may fairly accurately be taken as 360° or 0°. The magnetic bearing of the southern doorway running from east to west, determined several times lies between 269°-45′ and 270°-15′; hence it may fairly be taken to be 270°.

On referring to the Surveyor General, India, I am informed that the magnetic north at present is 1°-16′ east of the true north at the town of Puri; but as the village of Konarka is about 20 miles distant from the town of Puri as the crow flies, the magnetic direction may be taken as the same at both the places; hence the deviation from the true north of the north line determined by the Orissan architects amounts only to 1°-16′ which may be considered negligible in those days; this receives additional weight from the consideration that the magnetic deflection *at present* is 1°-16′ and nothing is recorded as to what was the case so many centuries ago; it might have been less.

From the above it is apparent that the directions used to be ascertained carefully before laying out the foundation. By reference to the ceremony of Dikpati Yaga mentioned in Chapter VI, it will be seen than an accurate determination of the points of the compass was an important part of the duties of an architect.

The directions used to be determined, and are so done at present in many parts of India, by the method of Gnomon or *Sanku*. This method, though not very accurate in ascertaining the true direction, is enough for all practical purposes, and hence a method exactly similar to this one has been invented in modern treatises on surveying, viz., Roorkee Treatise on Surveying. I quote below this rough method as described in the Sûrya Siddhanta.* I may mention incidentally that the accurate method of ascertaining the directions was well-known to the Indian astronomers. The principle of the gnomon or *Sanku* is as follows. The gnomon of a definite height is to be erected on a plot of land, the level of which is to be tested

* शिलातलेऽथवा संशुद्धे वज्रलेपेऽपि वा समे ।
तत्र शङ्कुप्रमाणेन समं मण्डलमालिखेत् ॥
तन्मध्ये स्थापयेच्छङ्कुं कल्पना द्वादशाङ्गुलम् ।
तच्छायाग्रं स्पृशेद् यत्र वृत्ते पूर्वापराह्णयोः ॥
तत्र बिन्दू विधायोभौ वृत्ते पूर्वापराभिधौ ।
तन्मध्ये तिमिनारेखा कर्तव्या दक्षिणोत्तरा ॥
यास्योत्तर दिशोर्मध्ये तिमिना पूर्वपश्चिमा ।
दिङ्मध्य मत्स्यैः संसाध्या विदिशस्त्वङ्गुलैव हि ॥
इति सूर्यसिद्धान्ते तृतीयोऽध्यायः विग्ग्रहाधिकारः ।

by water; describe a circle of a definite diameter with the foot of this gnomon as centre. On the circumference of this circle the gnomon casts its shadow which moves along as the Sun moves in its diurnal course. Mark on the circumference the shadow cast by the gnomon just a definite period after and before sunrise and sunset; the extremities of the line joining the above two marks will roughly indicate the east and west, the former being represented by the shadow of the gnomon in the afternoon. Describe two more circles with these two points as centres, and the length of the line joining them as diameter. The straight line joining the points of intersection of these two circles points towards the north and south.

Foundation:— The soil of Orissa has a hard substratum of laterite a few feet below the surface; unlike other buildings trenches for foundation were not dug, but the whole surface proposed to be covered used to be excavated till the hard substratum was reached; the whole surface was then built up with stone, and from the plinth level the walls were to be raised.

Plinth or *Upanam* (उपान):— The temples of any importance are generally provided with a plinth; but there are many important temples which have no plinth at all; as a typical case the temple of Lingar*a*ja at Bhubanesvara may be cited as an example; it can therefore be expected that the small temples scattered here and there at Bhubanesvara should show no plinth,

and should therefore start at once from the pavement or *tala-pattana.*

The plinth in the case of some temples is very high (Vide Plates XV. A, XXII, XXV) ; the plinth in many cases consists of two tiers ; and in only one instance I have noticed it to consist of 3 tiers as in the Bhogamandapa of the temple at Konarka.

In the case of a plinth consisting of two elements, the upper one is called the *Khür Pristha*, and the lower, the *Tala-Pristha ;* the former recedes back from the latter by several inches. In a temple dedicated to Vishnu, the Khür Pristha is carved with the petals of lotus, and in a Saiva temple, no such carving is noticeable ; a temple dedicated to Siva does not usually consist of the two elements noticed above. It may be mentioned here that this *Khür Pristha* is higher than the *Talapristha* ; the following figures will convey some idea as to their dimensions.

(1) Ananta Vasüdeva temple :—

Bhogamandapa :—

(*a*) Tala Pristha.....2′—3½″

(*b*) Khür Pristha.....3′—1¼″

Jagamohana :—

(*a*) Tala Pristha.....1′—1″

(*b*) Khür Pristha.....3′—11″

(2) Rajarani temple :—

(a) Tala Pristha.....1′—11″

(b) Khür Pristha.....2′—7″

(3) Bhogamandapa at Konarka :—

(a) Tala Pristha.....2′—1″

(b) Khür Pristha.....9′—7″

(c) Upper Khür Pristha...4′—5″

The Khür Pristha of Rajarani temple is very beautiful by reason of the mouldings shown on the face. (Vide Plate XV). It consists of *Pâda*, *Kani*, and *Basanta*, and the intervening narrow recesses are carved with *jâli* or lattice work. The Tala Pristha usually presents a plain face.

The Indo-Aryan style is eminently astylar; its very form does not admit of the introduction of pillars or columns for external decoration. In Sukra Niti, too, I have come across the passage* quoted in the foot-note, prohibiting the use of columns in a building or a temple surmounted by a spire ; columns are, however, used inside the structure in some cases, not of course, in a Vimana or sanctum ; they are used mainly as props for the ceiling, and not for any ornamental purpose, and from these

Pedestal or *Upapitha* (उपपीठं) :—

* प्रासादे मण्डपे वापि शिखरं यदि कल्प्यते ।
स्तम्भस्तत्र न कर्तव्याभित्तिस्तत्र सुखप्रदा ॥ १३२ ॥
शुक्रनीतिसारेचतुर्थाध्यायस्य चतुर्थप्रकरणम् ।

columns foiled arches spring to carry the roofing. I may mention here that the arches referred to are formed by horizontal corbelling.

Column.

In Orissa we do not find the principle of column much developed; and even those met with in very important temples are without any ornamental pedestal as we come across in the southern part of India. The columns here rest on plain rectangular pedestals; I may, as a typical illustration, cite the case of the Bhogamandapa at Konarka; such an elaborately carved structure standing on three tiers of plinth receding from one another is provided with four columns inside, standing on pedestals 2'—10" high presenting a bare appearance and having not a single carving, or a moulding including a fillet or a bead to decorate their surfaces. The bases of the columns in the Bhogmanadapa of the great Lingaraja temple are most disgusting; these have been rendered all the more so by the way in which the plaster coat has been applied. The artistic taste of even a connoisseur of art receives a rude shock at the bareness of the pedestals. Not to speak of carvings or mouldings, we do not even notice the necessary offset given to the column at the top of the pedestal in order to present an appearance of stability.

There is another defect in the construction of columns in Orissa. The column as a structural whole has definite compo-

nent parts, e.g., the pedestal, base, shaft and entablature; the columns here have no shaft or entablature clearly defined; from the pedestal rises the column showing the characteristic mouldings of the outer wall of the *bâda*; then the purely rectangular portion continues till the springing line is reached; exception is, however, furnished by the *Aruna Stambha* standing in front of the eastern gateway of the temple of Jagannath at Puri (vide Plate XX); in that case, I may say, exception proves the rule.

A later development in the principle of columns is, however, noticed in the pillars of the cook-room to the southeast of the Jagamohana at Konarka; the structure does not exist, nor is there any trace of it except a few columns scattered here and there; in this case we notice a definite column base, a shaft, and an entablature; the columns are octagonal and tapering from below upwards; stop-chamfering is noticeable in the base of the column to make the shaft more sharply defined; the entablature has a distinct abacus.

Construction of walls:—

The walls of the temples are made wholly of stones; they are not hollow. Great care has been taken in building the two faces of the wall, and the interior filling in of walls with rubble stones does not appear to have been neglected by the Oriya architects. I have studied this with advantage in the walls of the sanctum at Konarka.

The interior of the wall is solidly packed with horizontal blocks of stone laid in courses; I have noticed the introduction of wedge-shaped blocks of stone in the interior; this is calculated to ensure the solidity and stability of the interior to a great extent; these blocks of stone have been evenly laid and connected together with iron cramps. The Uriya architects were perfectly aware that a careless filling in of the interior would effect an unequal settlement of the wall, and would accordingly hasten its collapse. This care on their part made them dispense with the use of thorough bond stones at regular intervals. The walls present ashlar faces consisting of carefully dressed blocks of stone. The treatises on Hindu Architecture, and the Puranas lay particular stress on the use of well-dressed cubical or rectangular blocks of stone. I have already quoted a passage (page 102) from the Matsya Puranam directing the use of such stones.

Bonds :—

A conscious attempt is noticed at breaking the vertical joints, or in other words, preventing a vertical joint between any two blocks of stone in one course from being in a continuous line with that between any other two in a course above or below the one already mentioned. Their attempt, however, is not successful, and the breaking of joints is not what is expected; in some cases the joints have not been broken at all, and in some, the lap

between two contiguous vertical joints is so small that they form for all practical purposes a continuous vertical joint; in many cases I have noticed the masons to be very careful in maintaining bonds, and in many others, to be very careless; for instance, I have noticed the blocks of stone of the Konak-*paga* in many cases, to be inserted skilfully into spaces for the Anartha-*paga*, while in others I have observed very fearful gaping, and continuous vertical openings between the Konaka and Anartha *pagas*. It may be mentioned here that this disregard or rather want of thorough regard for the bond as an effective means of ensuring the stability of a structure has brought about the collapse of many temples; this is due to water gaining access through the interstices, and reaching the the iron cramps which are oxidised by the combined action of water and air, swell in volume, and thereby cause a great strain, too great for the stone blocks to resist; and they have a tendency to splinter off accordingly. Stone dowels, if used instead of cramps, would have rendered the structures more lasting; and the engineers of the P. W. D. have acted very wisely in using stone dowels for connecting the blocks of stone together in the works of restoration and repair.

We can not blame the Orissan architects for the use of iron cramps; for their use is noticeable from very ancient times,

The Persians also used to have recourse to this device in connecting together huge blocks of stone.*

I have already remarked that the blocks of stone are noticed to have been laid horizontally; I have in many cases tested the perpendicularity of the walls with a plumb bob; the walls are true to the plumb line; to this fact coupled with that of perfect horizontality of courses is mainly due the stability of the edifice.

Plumb :—

The thickness of walls is guided by the proportion and height of the edifice to be raised. I have tried to fix a definite formula for the thickness of walls; I am glad to be able to say that my efforts have been partially crowned with success in case of a *Pida Dewl.* I have been able to determine an equation which will yield fairly accurate results. It is as follows :—

Thickness of walls :—

The thickness of the wall of a *Pida Dewl* = $\frac{1}{2}x$. A, where x = distance between the R*a*h*a*p*a*gas; A varies from $\frac{6}{14}$ to $\frac{6}{21}$ or $\frac{3}{7}$ to $\frac{2}{7}$.

Let me verify the accuracy of the equation by citing the following cases.

Mükte*s*vara temple :—

Length of the Jagamohana between the R*a*h*a*p*a*gas = 26′

Theoretical thickness according to the above equation should be = $\frac{1}{2} \times 26 \times \frac{6}{15} = \frac{78}{15} = 5'\text{-}2\frac{1}{2}''$

It is curious to note that discrepancy is nil in this case.

* Perrot and Chipiez, History of Art in Persia.

Anantavasudeva temple :—

(*a*) The length of the Jagamohana between the Rahapagas = 33′.

Theoretical thickness = $\frac{1}{2} \times 33 \times \frac{6}{14} = \frac{99}{14} = 7\frac{1}{14} = 7'$ (say)

Actual maximum thickness = $\frac{33-19}{2} = 7'$

Discrepancy is nil.

(*b*) The length of the Natmandir = 24′

Theoretical thickness = $\frac{1}{2} \times 24 \times \frac{6}{21} = \frac{24}{7} = 3' - 5\frac{1}{7}''$

Actual maximum thickness = $\frac{24' - (17' - 4'')}{2} = 3' - 4''$

Discrepancy = 1 inch which may be neglected.

(*c*) The length of the Natmandir = 29′

Theoretical thickness = $\frac{1}{2} \times 29 \times \frac{6}{17} = \frac{87}{17} = 5' - 1\frac{1}{2}''$

Actual maximun thickness = $\frac{29 - (18' - 9'')}{2} = \frac{10' - 3''}{2} = 5' - 1\frac{1}{2}''$

Discrepancy is nil.

Doors, windows and niches.

The doorways of the temple have square perpendicular sides; the jambs are not splayed or chamfered so as to make the entrance look wider. On referring to plate IV. illustrating the plan of a Pancharatha Dewl it will be clear that the jambs are too thick to render splaying effective in any way; besides, the width of the doorway of important temples is usually so great as to dispense with splaying as an effective means of facilitating ingress and egress; for the friction caused by the rush of pilgrims for so many centuries has not been so much as to make the arrises lose their straight outline.

Only one doorway leads from the Jagamohana to the *aewl* which is not provided with any side-doorway, Side-doors are noticeable in the Jagamohana, Natmandira, and Bhogamandira. I may state here incidentally that the arrangements for the introduction of light and air in an Orissan temple, nay in one of the Indo-Aryan style are most unsatisfactory. The reason of it has been clearly stated in the next chapter.

The Dewl is not provided with any window or any other opening either for light, air or outlook. The Jagamohana, however, is often provided with side-windows consisting of balusters (vide plate XIV), as in the Lingar*a*ja, R*a*jar*a*ni, Siddhe*s*vara temples, or windows containing perforations, rectangular, or diamonded as in Mükte*s*vara, Para*s*ür*a*me*s*vara temples. Vide plate IX.

There is, however, noticed an exotic style of window opening or more properly inlet windows technically called clerestory windows, as in the Jagamohana of Para*s*ür*a*me*s*vara, Vait*a*l (vide plates XII, XVIII). The clerestory may be likened to a sky-light, and is formed by a small upper storey perforated with small windows, and surmounting the main lower storey. The upper storey is formed by a sloping roof supported on wedge-shaped uprights the intervals between which form the clerestory windows.

Non-provision of window openings is a characteristic defect

of the Orissan, nay of the Indo-Aryan style of Architecture.

Niches. Niches occupy the position of the windows. These serving no purpose for the provision of light and air are simply meant to decorate the outer faces of the temple. These niches contain images of gods or goddesses described at great length in the sixth chapter. They are surmounted by a canopy or tiers of canopies (vide plates VII, XIII) receding back from each other, and nicely decorated with carvings. These canopies crown the niche proper or the recess (vide plates VII, X) or the entire width made up of the recess and the two pilasters flanking it (vide plate XIII) as in the cases of Müktesvara and Brahmesvara. In cases where the canopies surmount the recess only they are usually topped by a sort of dripstone moulding (vide plate VII) resembling *Pâda*.

This arrangement of protecting the niches by canopies is at once simple, and elegant. The Gothic gable with side pinnacles, as is noticed in the Cathedral of Florence*, or the Renaissance front or upholstery replacing the former as in the porch of the church of St. Appollinare, would be but poor substitutes for this simple contrivance.

Hoisting of stone blocks. and iron beams. It is a matter of great wonder as to how could so very heavy stones and iron beams be raised to such a great height before the invention of steam engine,

* Ruskin, The Stones of Venice, vol. I., p. 175 (edited by L. March. Phillips.)

wirerope, derrick or pulley block. Our imagination is raised to its highest pitch in trying to discover the contrivances that the Hindu architects had recourse to in raising, fitting and fixing these heavy beams and blocks of stone. The huge stone figure of the lion meant for the Vimāna at Konārka was raised to a height of about 100 ft., and was brought from a quarry at a distance of many miles from the actual site of work across forests, swamps and rivers with inadequate means of communication.

It is still a problem for the modern engineers to ascertain the method used by the ancient school of architects; they explain away the difficulty by assuming that the Orissan architects resorted to the contrivance of the inclined plane made of sand, as a statical machine, and that the blocks had to be dragged along the line of the greatest slope; even if we admit the possibility of an inclined plane the question may still be asked as to how they could manipulate such huge blocks at all. There is another difficulty in the assumption of the inclined plane; as the structure increases in height the line of slope changes, and hence this contrivance of the inclined plane is to be adjusted at every step of progress by changing the base and height of the plane, and the difficulty is all the more aggravated if the plane be made up of heaps of sand.

A moment's reflection would convince us how absurd must be the supposition that the structures were covered with

sand both inside and outside as they increased in height, and that the blocks of stone used to be dragged to the required height and position along inclined planes or ramps made of sand. The absence of sand in the locality of Bhubanesvara would be a damaging proof against the accepted supposition ; although we cannot exactly determine the contrivances or methods used by them, it can safely be asserted that some sort of staging used to be made certainly over which the blocks of stone used to be hoisted by means of winches ; it is not unlikely the case that the Hindus were acquainted with the use of some sort of pulley, however crude it might have been in design ; I must admit here that I have gone through the Sukra Niti, Btihat Samhita, Agni Puranam, and many other treatises on Arts and Architecture very carefully, but nowhere I have come across any technical term for a pulley, or a winch, or a description thereof.

Iron beams.

The following fact which I noticed at Konarka, clearly indicative of great engineering skill is worth mentioning. I noticed several beams at Konarka not of uniform cross section, the dimensions of which are quoted below.

Length taken along the centre	...	23′
Thickness at the end ...	...	9¼″
,, ,, ,, centre ...	...	11″

The above dimensions are of a lintel over the southern

doorway of the Jagamohana; from them it is atonce apparent that the longitudinal section of the lintel presents the form of a parabola. It is a fundamental rule of Applied Mechanics that if a beam be supported at both ends, and uniformly loaded, the maximum bending moment occurs at the centre of the beam, and that the locus of bending moments is a parabola. Hence it follows, that for a beam of uniform strength the breadth is constant, and depth is varied to suit the varying stresses. This principle has exactly been followed in forging these huge iron beams. This reflects a great credit on the architects.

By applying the usual Deflection formula, and taking the usual value of the Modulus of Elasticity of wrought iron, I have tested the stiffness of these beams; and I am very glad to be able to state that the beams are within the prescribed safe limits; stiffness has been secured without any unnecessary waste of material.

Very seldom have I seen the beams or lintels to sag. One memorable example is, however, noticed in the lintels over the southern doorway of the Jagamohana of Lakshmi's temple within the precincts of the temple of Jagannath. This is not probably due to the insufficiency of the section chosen, for the lintel over the eastern doorway has not sagged at all, although it has nearly the same section; the sagging is explained by the fact of the architects having inadvertently placed the lintels

along the depth and not along the width, and also having chosen a less number than what would have been sufficient.

Aim of Architecture.

The aim of Architecture should, mainly speaking, be fitness, stability and beauty. It should present a harmonious development of these three principles. The Orissan Architecture is pre-eminently a religious one, and as such, its fitness will be dealt with later on ; we should always bear in mind that the structures, in question, were not dwelling houses, but places of worship. By its constructive peculiarities, stability has been much more ensured in Orissan Architecture than in other forms ; but this has been effected at the sacrifice of economy which, according to Vitruvius, was one of the seven principles of Greek Architecture.

System of forces called into play.

The style of Orissan temple building rendered economy impossible ; this, I have already stated, derives its vital principle from the deeply ingrained sense of permanency. The trabeated style resorted to by the architects ensured stability of the temples, for no inclined thrust is called into play here. It is too obvious to state that the manipulation or statical adjustment of an inclined pressure is very difficult ; and the occurrence of unknown agencies renders these inclined thrusts very complex, and hence the equilibrium of the edifice becomes a matter of theoretical speculation which does not invariably obtain in practice. Economy has no doubt

been sacrificed, but with the compensating advantage of stability. The statical equilibrium in an Orissan temple is simply due to the combined action of the simple vertical action and reaction.

The only break in the uniformity of statical design of compression is caused by the use of the architraves where cross strain is called into play. The principle of subjecting materials to cross strain introduces a weak element in the whole system; for the sake of permanency, this weak element involves a waste of materials. It causes a certain amount of uncertainty in permanency so fondly sought to be ensured. The Orissan architects had accordingly to use iron lintels or beams as supports for the stone architraves. Most of the forces affecting the equilibrium of the structure are those of compression. A cross strain calls into play the forces of tension and compression; hence I may say that the Orissan style of construction is a combined one of tension and compression. I call it a Tensio-compressile system.

Durability :—

The durability of the temples is mainly due to the way in which the thrusts are exerted, and to the hugeness and horizontality of the blocks used. The thrusts are not only perpendicular to the bearing surfaces, but also vertical. This is a great source of strength and durability. The use of vertically perpendicular thrusts, and

the elimination of inclined ones may be considered the chief causes to which their durability may be ascribed. The system of trabeation or corbelling entailed to some extent the use of massive blocks. This method of construction gave the walls a tendency to be thrust inwards, and introduced, by its very nature, a weak element. This tendency has been counteracted by the huge topping courses, the Beki, and *A*mlaka ; it is too obvious to explain how the counteraction is effected. By the above remark, I do not mean that the walls would instantly be thrust inwards as soon as the capping or topping course is removed. I have noticed several instances in which the temples are still standing *in situ* although the *A*mlaka has been removed.

The durability of an Orissan temple is mainly due to the factors to which reference has been made ; it is also due to the nature, both chemical and physical, of the component stone blocks of which it is made. The stones principally used are different varieties of sandstone mentioned in the seventh chapter. Stones brought from the locality of Khandgiri hills are coarse-grained, and easily liable to the disintegrating influence of the atmosphere, and as such they easily crumble into pieces.

The durability of stone is also due to the nature of the cementing material of the grains of which it is composed. I have noticed in the seventh chapter that the matrix of some

varieties of sandstone employed is calcium carbonate which renders them susceptible to the destroying influence of the atmosphere. Except in the town of Puri, the atmosphere of the place does not fortunately contain any deleterious substance that might hasten the disintegration of the stones. The Rangdalima variety of sandstone containing ferric oxide and fine grains of quartz or silica is very durable, and the temples built of them do not show the least trace of disintegration anywhere.

The temples on the sea-side, and in tracts containing sand dunes as at Puri, Konaraka, are less durable than those in the interior. The drift sand being blown by high wind against the face of the temples gradually grinds it away ; and so we notice a marked difference in the relative durability of temples built of the same variety of sandstone in the interior and near sea-side respectively. There is another source affecting the durability of the structure to a considerable extent. The stone blocks are noticed to have been connected together by iron cramps doubled over ; when rain water gai access to them through the interstices between the blocks, they invariably become oxidised, swell in volume, and cause an unusual strain ; and thus the stone blocks are sometimes detached or displaced from their initial position. I have seen such displacement in many cases.

SCULPTURE.

CHAPTER VI.

The Spiritual basis of Orissan decoration.

Very aptly has Fergusson remarked regarding the Linga-Rāj temple, Bhubaneśvara that "if it would take a sum—say a lakh of rupees or pounds—to erect such a building as this, it would take three lakhs to carve it as this one is carved."* There is a great truth underlying the above statement. It is an unmistakable indication of their earnestness to make such an expensive outlay; for there was nothing which they prized so highly as religion. It was the be-all and end-all of their lives. Every thing they did was ascribable to this instinct. Religion was the mainspring of their activities. It was not an excrescence, but a vital part of the system. Hence it is natural that their architecture which was an outcome of their deep-seated religious instinct should be pervaded by a sense of earnestness. In this respect they were even superior to the Greeks, not to speak of the Romans. The religion of the Romans was borrowed from the Greeks, and was a matter of form, and hence lacked in earnestness. The Greeks somewhat attempted at self-glorification; the ideal of the Hindus was self-abnegation.

* Fergusson, History of Indian and Eastern Architecture (1876), pp. 421-22

The Temple-Architecture of Orissa was as it were an offering presented to the deity. To the architects, the building for the deity to live in must be worthy of him ; hence from the pavement to the pinnacle, it is full of exquisite carvings feasting the eye and soul of the devotee from a distance. The little temple of Müktesvara, or Parvati is an apt illustration of the above remark. One is sure to feel a sense of rapturous delight at the sight of Müktesvara in front of the *torana* or gateway. How exquisitely beautiful ! The architects must have poured forth the full exuberance of their hearts in designing the ornaments. We notice everywhere a conscious attempt to reach a consummation of the decorative art.

A building decorated with beautiful devices and designs shows the spirit of self-sacrifice pervading it ; all the lines of the design unmistakably illustrate the noble self.

Spirit of self-sacrifice.

A building devoid of ornamentation looks ugly for two reasons ; firstly, it does not appeal to the senses inherent in man, secondly, it exercises a definite psychological effect ; it is purely mental. The structure, referred to, bespeaks the selfishness of the designer, or rather the deadening effect of the idealisation of utility. Everything in the world is seen and felt ; this is more so particularly with a building or structure which presents an organic combination of different forms. Now, if the spirit of selfishness so manifest in an ordinary,

undecorated or unarchitectural building offends us so clearly, how much more would it do in the case of a temple or a shrine. Here we are to sink our petty jealousies, and differences, settle our disputes, in fact we are to rise above every little thing of the world, and to be with the gods ; and as such, want of decoration, the concrete expression of gross selfishness, becomes very offensive to the eye, as well as to the soul. I should remark incidentally that as the very existence of society demands of every individual unit to perform his duties, so is it equally incumbent on every builder or designer to make his building architectural. I think it is a part of our rights to expect every building to fulfil all the necessary conditions of architecture ; it should not be allowed to offend the sense of sight as a return for our allowing it to intercept our air, light, view of the azure sky, and bounteous nature.

The decorative idea has been manifesting itself since the dawn of history ; this sense actuated the primitive man in his humble sphere of life with the crude means of satisfying the wants to which he used to attach the same amount of importance as we do to ours in this advanced age of civilization.

It is natural that this idea of decoration should be applied to architecture which is the concrete expression of a nation's genius, foibles and wants ; we need not even be astonished at the conflict between the decorative

Architecture and Decoration.

idea carried to the extreme, and the constructive idea which lays, as it were, the foundation for the former. Architecture without decoration is not worth the name ; it is not construction ; the one must not be taken for the other. The latter is a part of the former. Architecture is the index to the nation's life and sentiment. It is complex in nature, and this complexity increases in accordance with the nation creating it. The nation which has imbibed the spirit of beauty to a great extent, has its architecture commensurate with it. This spirit becomes reflected on the works of art that the nation produces. History bears testimony to it. When the nation degenerates its architecture also deteriorates.

Some are inclined to attach no value to decoration, and would condemn it as superfluous, serving no end. We need not wonder at it, for this is the spirit of rank utilitarianism ; everything that falls short of this standard is rejected as useless. Utilitarianism has, I am sorry to remark, divested life of half of its pleasures, and has rendered it dull and insipid. Now, huge mounds of brick or stone, wood or iron are considered as good specimens of architecture. These, fortunately, do not at all come under this category. They may contain good illustrations of the Principle of Least Resistance as propounded by Moseley, or of Gordon's formula ; but do they appeal to eye, intellect, and the noble sentiments inherent in

man ? Do they produce that harmony or repose which is caused by the proper adjustment or balancing of parts appealing to the different senses ?

Nemesis in modern Architecture.

The structures of the present age betray a sad want of the application of this fundamental canon of Architecture. As opposed to the decorative idea carried to the extreme in the past, a retrogressive reaction has already begun to set in ; since then the constructive idea has eclipsed the decorative one, and and we have come to the other end of the diameter. This is the true nemesis action. The present tendency of the age is to confine what remains of architecture within the narrow compass of set formulæ. There is a marked tendency of having the style stereotyped, which is not uniform in all ages and clime, but varies under different conditions. We can not reasonably expect a uniformity of style in all countries ; we can not even expect it in all the different provinces of India. The pediment, metopes, triglyphs of the Grecian temple, would be very poor substitutes in an Indian one, or, the *kalasa*, *karpuri*, and *amla* of an Orissan temple would spoil the beauty of a cathedral. It has been very wisely remarked by E. Viollet-Le-Duc that, "if the Parthenon is in its place at Athens, it is but an absurdity at Edinburgh, where the Sun prevails over the mists only for some days in the year....Art therefore does not reside in this or that form, but

in a principle, a logical method."* "It is barbarous to reproduce the Greek temples in the streets of London or Paris."†

The Orissan decoration is of three kinds, (a) Constructive, (b) Representative, and (c) purely Ornamental or Decorative.

Classification of Orissan Decoration.

The pilasters containing statuettes in their niches, and ornamented with an infinite variety of scrolls mainly come under this head. The tiers of cornice noticed in the Jagamohana of the temple at Konarka are particularly picturesque. By their constructive peculiarities, beauty has been ensured to a great extent. The protruding brackets of the caves, and temples have added much to the grace of the structures. The Representative class admits of two subheads, (a) Natural, and (b) Conventional. As an illustration of the Natural type I may refer to the leaves of plants with their radiating veins represented in the centre of the main pilasters of almost all the temples (c. f. Rajrani, Konarka). The full-blown lotuses with their stalks as noticed at Konarka have been most faithfully copied from nature. The life-like representations of monkeys as seen on the Muktesvara temple (Vide plate IX), or the elephants as seen at Konarka, or on the temple of Ananta Vasüdeva may be referred to as instances of their excellence in imitating nature.

* E. Viollet-Le-Duc. Lectures on Architecture, Vol I. p. 56.

† p. 57, Ibid.

The towering lions over crouchant elephants placed in the recesses between the pilasters may be cited as the best example of the conventional class of the Representative type.

The Orissan temples furnish good specimens of the purely Decorative type of ornament ; of this, they have an infinite variety of patterns both geometrical, and asymmetrical. This type of ornaments consists of various scrolls, beads, tassels, or geometrical patterns. The scrolls on the surface of Muktesvara (Plate-X) are specially noteworthy ; in them the transitions from the curves to the straight lines are very gradual, and not sharp so as to produce an irritating effect on the retina ; curves of double flexure are so designed as to make one merge into the other.

Æsthetic or purely Decorative type.

The representative or symbolic ornament directly appeals to our intellect, whereas the purely decorative or æsthetic type, to our feelings. The æsthetic has no special purpose to serve except appealing to our sense of the beautiful based on gradation, contrast, symmetry, distribution or arrangement, radiation, continuity, colour and such other cognate ideas inherent in man ; I shall try in the following pages to explain and describe the above principles of the Orissan style of decoration.

The symbolic and Æsthetic types.

In Orissan Architecture, the superstructure of the sanctum is curvilinear ; this is more beautiful than a pyramidal one, as

Plastic form ensures grace.

is noticed in the temples of Upper India, or in structures of the Dravidian style. By the adoption of this plastic form the possibility of ornamentation has been more ensured than it would have been in flat, inclined surfaces. In a pyramidal tower the geometrical, or rather the mechanical impression effected by a straight contour is offensive from an æsthetic point of view. This has been successfully avoided by the selection of a curvilinear form.

By the introduction of pilasters or *pâgas* the beauty of the structure is enhanced remarkably ; but the plastic and curvi-

Pilasters and Pinnacles :

linear form of the pilasters renders impossible the surmounting of them by pinnacles as in Gothic structures. This is also due to the rather large forward projection of the *Amlaka Sila*. As the tendency of the walls is to be thrust inwards, it is desirable for the sake of strength that the pilasters should project from the main walls rather within, than without. This is usually noticed in some French churches, as the cathedral at Amiens. In Orissan Architecture the pilasters have been intended more for beauty of design, and play of light and shade than for strength.

Making allowance for the doorway an Orissan temple is of the equifacial type ; it presents the same face in all directions.

Equifacial type and its defects.

The architect has not to experience much difficulty in designing structures of an equifacial

type. The statical adjustment of the forces called into play becomes far easier than in the trifacial or multifacial structures This is more so in a trabeated style ; it must be admitted here that the beauty caused by a rich variety of forces entailing a complicated design is sadly wanting in the Orissan style. This is an inherent defect of the Indo-Aryan school or rather the Indian school of Architecture. This defect has been aggravated by the astylar form. The architecture of Orissa is eminently astylar ; its very form renders columniation impossible ; hence we do not come across that sublimity resulting from the perspective effect as is noticed in the temples of Rameswra, or Madüra (c. f. Tirumalla Nayak's Choultrie, Madüra).

Effect of Astylar form.

The artistic effect produced by collonading or arcuation or a combination of both cannot be sought in an astylar form or a trabeated one. The effect is due to perspective, and a play of light and shade caused by a multiplicity of plane or curved surfaces. This is an inherent defect of the Indo-Aryan school ; and the style became so stereotyped that no attempt is noticed to have been made at making a departure, however slight, from the established one. There is, however, noticed an attempt at making good the above defect by the provision of most elaborate details ; this can be likened to an endeavour to improve

the component parts without attaching any importance to the beauty or propriety of the whole. To study these details one must be a connoisseur of art, but to study the whole no such qualification is necessary. He must be provided with a heart ; this is all that is demanded of him ; he cannot but be affected by the sublimity of conception. He will pause and think, and if he has time and competence he will try to analyse the beauty of details.

There are two distinct mental processes of appreciating the beauty of the two systems just described—Synthetic and Analytic. The mind will have to go through the analytic process (mainly) in recognising the artistic merits of the Indo-Aryan school, and a synthetic one in that of the collonaded, arcuated or arcaded type.

It is curious to note that the synthetic effect of ensemble has been neglected as compared with that of the other method.

Neglect of Ensemble.

This seems to be against the genius of the nation. For, the Hindus always aim at generalisation, and at discovering unity in variety. The synthetic method is typical of this discovery of unity in diversity. In this connection it must be admitted that the Greeks were far superior in this respect to those who inaugurated the Indo-Aryan school of Architecture.

In Orissa the device of Fenestration was unknown as in

all Indian temples ; I have stated the reason briefly. This Fenestration. method of Fenestration in addition to the sufficient supply of light and air renders ornamental treatment possible in a remarkable degree ; the ancient builders of the rock-cut temples understood fully the value of it at such an early age. This is evidenced by nice carvings on the vertical and horizontal bands round doorways and in the tympana ; there is another pleasing effect brought about by the use of this device. It affords spots of darkness as contrasted with the lighted surface of the wall. It is too obvious to mention that a bare surface, however lighted, is not half so beautiful as that showing a play of light and darkness.

The defect of the Orissan Architecture due to the absence of the device of Fenestration was made good by the in- Niches. troduction of niches referred to already, containing the images of the Parsva Devatas, Dikpatis, Asta Sakhis etc. (Vide plates—VII, X, XIII). These niches admit of nice decoration illustrating exquisite symmetry, fine proportion, and a grandeur of outlines.

The niches are designed in the Sakkar or *Barandi* portion of the Bada ; (vide plate X) ; and all the *pâgas* are provided with them. The niches in the *Râhâpâgas* or central pilasters are the most important, and largest of all. The sides of niches are usually very exquisitely carved with floral devices

and scrolls, and are flanked by columns usually ending in panels containing human figures, or dwarfs. The niches are capped by tiers of awning, or hood showing elegant carvings (Vide plate—X); these projecting pieces are surmounted by an ornamental device containing a medallion enclosing the lotus, or the head of a human figure (Vide plate—X). I may refer my readers to the central niches of the Rajarani temple by way of illustration.

Central Niches

The images placed in the central niches are called Parsva Devatas, or side deities (vide plate—XIII). I have tried to come to a generalisation in respect of the Parsva Devatas; but unfortunately the images have been removed from most of the niches.

Parsva Devatas in the central niches.

The Parsva Devatas are not the same in all the temples, but differ according to the deities enshrined therein; thus they are not the same in the Saiva, Vaishnava and Saurya temples. In a temple dedicated to Siva, Kartic or war-god is placed in the niche on the back wall of the sanctum, Ganesa and Parvati, in those on the right and left walls, respectively, the position of the observer being at the rear of the sanctum.

Parsva Devatas for temples of different sects.

In a Vaishnava temple, (c.f. Puri temple) Kartic, Parvaty and Ganesa are replaced by Nrisinha, Vamana and Kalki respectively, these three being the three incarnations of Vishnü. In a Sakta or Saurya

temple, the arrangements are different. In the three niches of the temple at Konarka, the only Saurya temple worth the name, we find three figures of the Sun in different postures representing perhaps the Sun in different positions of its diurnal course in the heavens. In a *Sa*kta temple the three different forms of the goddess *Sa*kti are noticed. I may cite the case of the Vaital Dewl which is a veritable *Sa*kta temple, it being dedicated to Kapal Mochani, another name of the goddess *S*akti. In this temple, which, I have already noticed, is a departure from the usual type, the central niche on the back wall contains the dual image of Hara Gauri, the other two on the side walls containing the images of Dürga and Vairavi. In this connection, I may mention that the positions of Ganesa and Parvati have been reversed in the temples of Parasüramesvara and Bhaskaressvara. This is certainly due to the inadvertence of the P. W. D. in fitting the images in their respective niches after the restoration of the temples ; the engineers, in charge of the restoration work, might have been ignorant of the definite order in which the images should be placed in the niches.

Niches for the deities of the different points of the compass

I have already referred to the niches in the pilasters containing statuettes ; eight of such niches in the *Sâkkar* or the lower *Bârândi* in the eight Anarthapagas contain the images of Dikpalas, or

the presiding deities of the different points of the compass. Every Orissan temple of any importance is invariably provided with the niches containing images. I quote below the following passage* from the Agni-Pürȧnam wherein the particular directions are assigned to the respective Dikpȧlas in the ceremony of Dikpati-yȧga to be performed at the installation

* तुष्णीम्वावाह्य शक्रादीन् पूर्वादौ पूजयेत् क्रमात्
इन्द्रागच्छ देवराज वज्रहस्त गजस्थित
पूर्व्वद्वारञ्च मे रक्ष देवैः सह नमोऽस्तुते
वातारमिन्द्रमन्त्रेण अर्च्चयित्वा यजेद्बुधः ॥
आगच्छाग्ने शक्तियुत छागस्थ वत्सयुत ।
रक्षाग्नेयीं दिशं देवैः पूजां गृह्ण नमोऽस्तुते ॥
अग्निमूर्द्धेति मन्त्रेण यजेद्वा अग्नये नमः ।
महिषस्थ समागच्छ दण्डहस्त महाबल ॥
रक्षत्वं दक्षिणद्वारं वैवस्वत नमोऽस्तुते ।
वैवस्वतं सङ्गमनमित्यनेन यजेद् यमम् ॥
नैर्ऋतागच्छ खड्गाढ्य बलवाहन संयुत ।
इदमर्घ्यं मिदं पाद्यं रक्षत्वं नैर्ऋतीं दिशम् ॥
एष ते नैर्ऋत इति यजेदर्घ्यादिभि र्गुरुः ।
मकरारूढ़ वरुण पाशहस्त महाबल ॥
आगच्छ पश्चिमं द्वारं रक्ष रक्ष नमोऽस्तुते ।
ऊरुं हि राजा वरुणं यजेदर्घ्यादिभि र्गुरुः ॥
आगच्छ वायो सबल ध्वजहस्त सवाहन ।
वायव्यं रक्ष देवेस्त्वं समरुद्भिर्नमोऽस्तुते ॥
वात इत्यादिभिश्चार्घ्यं दद्यो नमो वायवेऽपि वा
आगच्छ सोम सबल गदाहस्त सवाहन ॥

ceremony of an image enshrined in a temple, I have carefully observed that the positions of the Dikpalas described in the passage quoted have not been deviated from in the case of Orissan temples; not only do their respective positions, or directions coincide with those fixed in the text, but the characteristic symbols and accessories have also been followed. Starting from the northern face we come across Küvera, or the god of wealth with the characteristic vehicle of seven jars in the north-eastern niche, and Pavana or the god of the winds with stag or deer as his vehicle in the north-western one. Varüna or the god of water with *makara* (capricornus) as his vehicle, is noticed in the north-western niche of the western face, and Nirita with a human figure as his symbol, in the south-western one. Yama, or the god of the nether regions with buffalo as his vehicle is seen in the south-eastern niche of the southern face, and Agni sitting on a ram is placed in the south-eastern one. Indra, or the king of the gods with an elephant or Airabata as his vehicle, is seen in the south-eastern niche of the eastern face, and Isana or Mahadeva with the bull as his vehicle is noticed in

रथचलमुत्तरद्वारं सकुबेर नमोऽस्तुते ।
सोमं राजानमिति वा यजेत् सीमाय वै नमः ॥
आगच्छ शान सवत्त शूलहस्त वृषस्थित ।
यज्ञसण्डपमध्ये शानौ दिशं रक्ष नमोऽस्तुते ॥
अग्निपुराणे दिक्पतियागो नाम षट्पञ्चाशोऽध्यायः ॥