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THE CREATION OF THE BEIJING OPERA HOUSE

by

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Report by Thomas Paris
Translation by Rachel Marlin

Overview

From the beginning, there was a defiant feeling. Both creators and their creations need to go beyond the status quo, to take risks and to find new horizons. This was the thinking of Paul Andreu, a partner at the *Aéroports de Paris*, when he decided to compete for the project of designing the Beijing Opera House. He challenged the normal rules very early on by giving priority to the coherence of the project and his vision of it. He won the project by consistently defying the rules. What followed was a creative process fuelled by feelings ranging from panic and doubt to enthusiasm, together with research and work. It was a group effort which meant that it had to be organised so that every person in this very diverse team could put forward his ideas, but that in the end, everyone had to move forward together in the direction dictated by the architect. This story is about a building site in China, where work was carried out in economic conditions which favoured a specific architectural design, and where ideas were able to change right up until the moment they were put into practice.

TALK : Paul Andreu

As Renzo Piano once said, in a world where there is no place left to explore, where can one still have adventures and take risks if it is not in the field of art and creation ? Travelling abroad and leaving one's familiar surroundings is as much a risk for a traveller and a company as it is for an architect. For the first part of my life – until I was more than sixty years old – I worked in airports, but for the past ten years, I have been involved with the Grand National Theatre of China in Beijing and the Beijing Opera House. The opera house is an enigmatic building, poised on water, standing out from behind trees in the middle of Beijing. It was an adventure.

A competition which breaks the rules ?

This adventure started with a piece of land in the middle of Beijing, near the Forbidden City and the Parliament (known as the National People's Assembly), in other words next to the historic and political centre of the city. This is an area which is of great significance and importance for the Chinese. When we received the plan for the competition, I first thought that there was a mistake as it seemed completely inconceivable to me that an opera house could be built so close to these symbolic places. The geographical location made the project even more interesting, but, at the same time, intimidating. My feelings ranged from enthusiasm, to panic and doubt. Such feelings are quite common in our profession. Perhaps the ability to have doubts, to assume those doubts and confront them without giving up is one of the principal qualities of being an architect.

We were in a competition in which other invited – and uninvited – architects were taking part. The invited architects were paid, unlike those who were not invited. I started off as an uninvited architect. The Chinese partners with whom I had been working withdrew three days before our project's deadline because they had received orders from their government to wait before associating themselves. In those three days, we had to start again from scratch. This should have comprised two phases, but in the end it had five or six, and lasted eighteen months instead of the five months initially envisaged. The process was, in fact, exemplary because the Chinese authorities only made the decision once they were convinced of the chosen project, whereas in France the competition often results in the declaration of a winner at the end of the stipulated time limit and in spite of dissatisfaction felt on either side.

Remus was right !

At every phase of the process, they asked the remaining candidates to change their project. Those who did so were eliminated : by abiding by the rules and changing their project, they ended up by spoiling it ! Complacency has never resulted in anything worthwhile. A certain degree of tenacity is reasonable, but is stupid when it gets too extreme.

Rule-breaking even proved to be decisive. At the outset, the rules of Chinese urbanism dictated that we design a rectangular building. The Prime Minister broke these very rules by deciding that the location of the building had to be altered. I made it very clear that I was not in the business of moving buildings like furniture, and I designed another building, an oval one ! In the end, despite everyone breaking the rules, we got what we wanted. After all, breaking rules has always made the world move forward. Romulus founded Rome, but Remus disobeyed and overstepped the line. His brother killed him, but he was still the one who was right !

Simple ideas and a complex project

'Art and architecture' conjures up images of very distinguished thinkers and inspirational characters wearing floppy neckties. This is an erroneous idea. Artists and architects are in close touch with ordinary life. They work, sometimes a great deal, and their work has a material dimension.

I started by making a series of sketches using many notebooks. I did not know very much, I was looking for something, and a kind of organised image started to appear : an opera hall in the middle, a hall on either side, a large public area, a sketch of the roof, and then three circles side by side which I took from old drawings of the three auditoriums at the Arche de la Défense in Paris.

One day, in the depths of doubt, when I was convinced that I was getting nowhere, I was talking with a friend. I took a metal coffee cup and a piece of paper which I folded, and the idea for the roof dawned on me. Finally, everything started slotting into place : the roof would close on two sides, surrounded by water, and there would be an opening which divided the roof in two. Suddenly, the project started to take form but it was still only an idea, in other words, nothing, an embryo which had to grow before it could be presented and convince people, which implied a lengthy amount of work on the functions of the building. An opera house is technically complicated. One has to develop spaces, bring them to life and make them attractive.

When the drawings become the project

The drawings, which we presented in 1999, looked like a bubble in the middle of water. At this stage they looked very similar to the finished product which was unveiled at the end of 2007. In the meantime, a huge amount of work was necessary to bring to life almost exactly what had already been drawn.

The project consisted of three halls : an opera hall with 2,300 seats, (the largest possible size which produced satisfactory viewing and acoustics) with a central stage, lateral stages with high ceilings, and floors below-stage resulting in a total height of seventy metres ; a concert hall with 2,000 seats ; and a theatre with seating for 1,100 people. The opera hall is the main part : it is in the centre, whereas the other two halls are at the sides. All three halls are located on the same level, beneath which is a large area consisting of three sunken floors of dressing rooms, rehearsal rooms and rooms for stocking scenery. Between them, there is a huge public space protected by a roof.

A living opera

The current trend is for increasingly large public spaces in opera houses. When Victor Louis designed the Bordeaux opera house, he created a very large entrance hall and a magnificent staircase which together mark the transition from ordinary life to the world of theatre. Garnier did the same by amplifying various elements, and the architects of the Bayreuth Opera did likewise by constructing a large path leading up to the opera house surrounded by a forest. They did so for emotional and functional reasons. They believed that the audience enters into another world and that, according to Utzon who designed the Sydney Opera house, there had to be something processional in the way in which one arrived at an opera house.

There are also more modern reasons for this huge public space. Opera-goers tend to be old. All opera managers would like to have a younger audience. What must one do to keep an opera alive ? How does one make it a lively place or a large cultural centre, with multiple possibilities open to all walks of life and not just ‘exclusive’ groups ? The Pompidou Centre in Paris was the first to give a modern answer to this question. It was designed without an obvious front door and with a terrace which has views of Paris. It is an example which I always had at the back of my mind during this project, not for its formal element but for its open spirit of heritage and space without social barriers.

In our project, the public space is under the lake. We decided to make a glass roof. Water, which is moved by wind and through which the sun shines, demolishes structures which are underneath it and makes them open to change depending on natural elements and the sun. From the outside, the theatre looks like a vague promise. On the inside, there is a large public space with a large ground area and galleries. The roof is made from red wood and there are staircases which are there just for visitors and not for access to the halls or the theatre.

A building site in China

The project was controversial and was halted for a year. We had to start again and rationalise it. Without changing it, we reviewed our intentions to create never-ending technical spaces but we preserved the project and saved the atmosphere, the halls and the theatre. After a number of ups and downs, we started in earnest. The building site was a long story. It began with a great deal of work in the first year only to be interrupted between the moment when digging started and when the concrete was laid. Nearly three to four thousand people worked on site.

The influence of local conditions

Architecture involves a huge amount of work in order to adapt to local conditions. In China, the organisation of construction sites relies on a sizeable work force and very little mechanised work. With time, these conditions will disappear, sites will become more rational, economic conditions will change, the work force will become more expensive and it will not be possible to practise this sort of architecture any longer.

After this initial phase we constructed the roof. Firstly, a ring was put in place to which all the radial beams were attached. Prior to this, the building work had been rather traditional, approximate, hand-made and with no cranes. Construction of the roof required the use of the largest crane in China and the workers started to show their skill in precision work. Once the ring had been manufactured (which took four months), the rest fell into place very quickly. The structure, weighing seven thousand tonnes, was mounted in seven weeks, in other words ten times faster than would have been the case in France. This was achieved rapidly and with great precision and care. We saw this three-dimensional structure appear, made of beams and bars which had the shape and the same resistant qualities as an egg shell.

The structure is made of plates of steel, six centimetres thick, cut into pieces, joined, welded and ground down to made a single piece. This architecture is both technical – since a certain amount of steel is necessary and certain instruments are needed to cut out figures mechanically – and is also dependent on a plentiful and high quality work force. This would be completely impossible in France but is still possible today in China. It was not a passing fancy or whim : structures with large plates of steel can be found in progressive Russian architecture, for example in the Gum market in Moscow. The way in which light glides off these structures is truly unique. This is what interested me.

One day, we saw the reflection of light which we had been waiting for and which we had not yet seen. It had been raining a great deal just before. The roof is made from titanium. Because titanium is very delicate and very thin, it has an interesting way of reflecting light. I had hoped to make a very modern building with no direct reference to China and without the need to please anyone or add any unnecessary complications. At the same time, I wanted to produce a building with very soft, rounded lines and which could blend in with surrounding greenery and appear through the trees like a reflection.

The halls and theatres

An opera hall is very complicated to design because everyone is constantly asking you to create something in a particular way. When the acoustician is happy, the set decorator is not, and when both of them are satisfied, you are not. There is always someone to tell you that you have forgotten something.

It is essential that everything which takes place on stage and in the hall comes together as a whole. I was told that an opera hall is not an auditorium. There are two vertical elements opposite each other, the stage and the public. I tried to meet these requirements by making the hall a sort of curved shape, in which the audience could see each other. We managed to achieve this by separating out the visible curves from the reflecting sound surfaces which are walls in the background. We also managed to insert lighting between the two. Depending on

the light, sometimes the wall may appear without any structure and sometimes it is tangible, which allows directors to play on the atmosphere of the hall.

Shoe box or vineyard

There are only two models for a concert hall : a shoe box or a vineyard. An example of a shoe box is the Viennese music hall, a large rectangular ballroom, which has perfect acoustics. The other model was invented thirty years ago in Berlin by Scharoun. Every architect, even those who say that they do not imitate, stick strictly to these models.

For this project, I drew a shoe box with rounded angles. I wanted a white, sober hall with an orchestra in the middle. I wanted there to be music in the foreground to fix one's attention, with less attention focussed on the rest of the hall, and for it to be as blurred as possible.

I designed a sculpture with acoustic properties for the ceiling. It was simpler to do it myself rather than to have to explain what I wanted. For the first time in my life, I made something with my hands rather than making drawings which someone else reproduced. Using the sculpture which I made in clay, the sculptors of the opera designed a model and the workers created it in polystyrene which was cast in fibre to make this ceiling. I was able to work on my own construction, and this was an experience which gave me new-founded pleasure. I was still breaking the rules, but why should a rule exist which dictates that I have to do the drawings and others have to execute them ?

Tradition or modernity ? To hell with that !

We were able to design works which would have been very difficult to do in France, for example our marble staircase with complicated shapes. We built it on site in polystyrene, corrected it with a pencil, re-cut it and brought it to the factory to be cut in stone. We produced it in a way which no longer exists today.

We also combined different materials. For example, to construct a wall, we combined an extremely rare black Chinese stone with a mixture of glass fibre and plaster which is the least expensive material in the world. We worked very hard on it : we went to the factory and had moulds made to give a cloudy aspect to the finished product.

We also combined shapes cut out by laser from a piece of thin sheet metal and placed them on silk. It was in deliberate defiance of conventional methods to have both high and low tech as well as modern and traditional elements.

An opera in Beijing

Gradually the construction started appearing above the trees. We started wondering what people's reaction would be to the structure. I was rather worried and even bothered because people did not seem very interested. It was very curious. Before the barriers to the site were removed, no-one tried to see over the top or underneath, but once they were no longer there, there were always two or three hundred people around, looking at it, taking photographs and walking around.

It is a building without doors and windows and as such is very striking. It feels like one is making a forced entry when one goes inside. This recalls legends from all sorts of countries like a Chinese legend about paradise which is discovered by following a path in the mountains.

A lot of ink has been spilled about the neighbouring building, built about thirty years ago, which is a mixture of pure Soviet élan, Ancient Egypt and a Chinese vision of space. My project disrespect it. I did not scorn or look down on it, I just built opposite it, like two different people who set up shop opposite each other. Buildings are like parents : one can respect them without having to like them.

DISCUSSION

Question : *Can you tell us about the budget and the size of the team involved in this project ?*

Paul Andreu : As far as I know, the project cost 350 million Euros. It might have cost twice as much in France.

After we had won the competition, we began the project with the *Aéroports de Paris* : our staff included twenty to thirty people in the architect's office and fifteen to twenty in the design office. After the draft, we left for China with a team of six, leaving ten people in the Paris office. Our Chinese associates, who managed the site under our control, had teams of nearly one hundred people. On site, we had a project manager with three architects and two engineers. As the project advanced, we reduced the size of our team and for the last eighteen months I was alone with the Chinese. Our relationship was sometimes difficult and sometimes complicated. When I was alone with them, they were extremely pleasant. In the end, I went out there every month for ten years because long-distance contact does not enable one to really sort out problems. At the end of every month, we had to see each other because the project could not make any progress.

The architect, a tyrant

Q. : *When did you feel the panic that you mentioned ?*

P. A. : All the time. The first time was when I was presented with the brief for the competition. Then you feel constant doubt, because there is an infinitely long period before you can see the result of what you have designed. At times, you get the impression that everything is fine until you change something and that spoils the existing work.

Q. : *From what I have understood, architecture involves an established division of labour which is conventional : the architect draws and others construct. How do you work with your teams ?*

P. A. : A large structure involves a great many people at the design stage and in the execution of the design. One has to get to the point where a certain number of ideas appear, are developed and then implemented without getting lost along the way. In the design stage, there are varied teams of architects, specialists (such as scenographers and colourists) and all the engineers for the structures, fluids and electricity. Organising these people and making them work together is a real problem. One has to oversee them, otherwise people naturally tend to go in their own directions. Here, it is important that they do the opposite and bring their ideas and everything which they have experienced in the past to the same precise direction regarding this structure. It is extremely complicated because nothing can be built on pure enthusiasm. There are constraints which are fixed and have to be respected… and sometimes resisted. The most enlightening piece of teaching I ever received was about the duty of disobedience given in a lecture by a general at the *École polytechnique*. The duty of dissent does not happen every day and is not for everyone.

One has to create a team and give this team reasons to work to avoid a situation where the team lacks ideas or where it becomes slightly disparate. One must lead this team. An architect does not claim to be able to do everything. He has to delegate a certain number of things, and these choices are also artistic ones. Yet, an artistic choice is not open to discussion and does not come about by group work but is something very personal. The difficulty is to make sure that individual choices do not give rise to a complete disappearance of any team involvement and do not result in committee or group decisions, doing a little bit 'here and there' just to make certain people happy. Making compromises is the antithesis of creation.

Faced with these difficulties, the strategy used by the architect will necessarily involve a study of what is essential, and the reasons behind it so that no concession is made and no delegation of work is possible. In other areas the architect may be less demanding.

I realise I am painting you a picture of a tyrant, an enlightened one of course, but a tyrant all the same. How does one change into a tyrant ? Since I worked on the *Arche de la Défense,*

which was not my architecture, I am convinced that one becomes a tyrant because one thinks that one is working to serve a building. It is the building, which may or may not have been one's idea, which gives the orders. In the name of the structure, because you are its servant, you can give orders and make demands.

It is not easy to have this power, and if you are not bound by some sort of morality which gives you confidence every morning, it can even be very difficult.

Q. : *What part of the work do you keep for yourself and what do you delegate ?*

P. A. : I have no rules. I draw a lot in my projects. It is the way I work, there are other methods which are just as good. Some of my colleagues never draw. Some draw very well, others make very quick sketches. The British architect Richard Rogers does not draw ; others draw for him. He looks, discusses, makes comments and choices, but he does not draw. The French architect Jean Nouvel draws very little but has a vision, he knows where he is going and he has a great eye. Personally, I never know whether it is my head leading my hand or vice versa and I need this interaction, I do not know how to function in any other way. I draw until I understand, sometimes even the ideas which people give me : occasionally someone with whom I am working says to me 'yes, that's good'. You never know what will happen next.

Chinese architecture ?

Q. : *The egg shape is one used for tombs in Chinese culture. This brought you some criticism for showing bad taste, being superstitious and so on.*

P. A. : The Chinese use analogies a great deal. In a cave, they do not see the stalactites and stalagmites, but horses and elephants. It is true that their tombs are egg shaped but to say that this shape is only to be used for tombs is wrong. It would be like giving in to a simplification of the life and language of shapes. I respect people's opinions, but I do not take them into account.

Q. : *You have said that you do not want to make unnecessary complications. Does the fact that you refuse to make references to local culture not result in a more globalised architecture, in other words, in structures which could also be easily implanted elsewhere in the world ?*

P. A. : A drop of water looks the same everywhere. A tear will always be the same on your eyelashes. However, the way in which one cries varies enormously from one place to another. The water drop is universal and the way in which one cries is cultural. This is the miracle of shapes and architecture ; a universal shape created at a specific place because the climate, the economy, the history and the culture are what they are, and the shape puts down its roots and becomes specific. Things on a global level do not interest me ; I believe in the universal. There are universal things. When we cry, we all cry in the same way, said the Merchant of Venice. I am interested in how something specific comes from something universal. I am passionate about this.

Q. : *Did the Chinese contribute something in particular to the solutions you brought ?*

P. A. : The collaboration was extremely productive, but I cannot say if the result would have been different with people from another culture.

During the early stages of the creation of the structure, we were faced with a geometrical problem. It is difficult to make an ellipsoid because the angles vary everywhere. It becomes a problem of execution, precision and measurement. Should all the pieces be different or should one design various groups with adaptable pieces ? How much would it cost to manufacture the different pieces ? How would we manage it ? Where would we stock the pieces ? And, since nothing can be perfect because of the differences between the pieces, how could we have the necessary leeway to manage to assemble the structure ?

We worked on these questions in Paris relying on our knowledge and that of entrepreneurs and manufacturers. We arrived at a solution which was complicated but we were not very

satisfied with it. The Chinese set about working and contributed two things. As far as the manufacture was concerned, they created outside panels, measured them and made them just-in-time in the site's factory, something which would have been unthinkable in France. There was no stock piling and there was just-in-time production. This changes everything. One's demands for precision changes. It is not perfect but they send you the panels which include the errors.

Next, they produced the idea of a specific piece, a sort of universal joint which allows pieces with very variable angles to be assembled. This piece was essential in order to construct an ellipsoid whose angles are all variable. It demanded a great deal of work and was the result of lengthy periods of research carried out with specialists in France and coming to terms with the Chinese who had different ideas. What resulted from this confrontation was a very complicated piece which is functionally very important and can be assembled in light without being visible.

We found their idea complicated, but they were right. We entered into a game with them in which we broke the rules and the limits ourselves. Real creation ought to take into account the entire process from the initial thought to the implementation.

Q. : *Do the Chinese have different work methods ?*

P. A. : To think that there is a difference is a trap. There are differences but the way in which one puts them forward is very superficial, just like saying 'all French women are redheads'. Yes, they are different, but much less than we are led to believe. However, the differences which do exist are extremely profound. When one arrives in China, one realises that their work methods are not that different. At the end of ten years, one realises that one has still not really understood how they function. One should be careful about this idea of difference and wary of people who give you lessons telling you what you need to do when you go to China. After all, if they allow us into their country, it is because they expect us to be different to them. They expect respect and difference.

Having said that, they have a way of submitting to authority, and perhaps they lack some sort of internal freedom. But in the next few years, they will be in a dominant position. They will have their own talented architects.

Is architecture a dying art ?

Q. : *You speak with a degree of nostalgia. You seem to say that soon we will never be able to work like you have done on this project.*

P. A. : We rationalised many things and industrialised sites. This enabled us to reduce costs and make life slightly easier. We can be proud of ourselves. Contrary to what one might think, this extends the length of time of the sites : we reduce the construction phase but we make all the other phases longer. Using this method of organisation, everything has to be thought out beforehand and prepared even though it is all in the future. I think that no-one, in any case not myself, is capable of projecting what the finished project will look like. One can have strong mental images which reduce the space but these are purely mental images. Confrontation with reality will bring up other things which will call upon our sensibility and our senses. However, this type of organisation deprives you of this confrontation with reality. You have to make provisions for everything, such as colours and materials. When you have prepared everything, things will start moving almost without you needing to get the machine started. There is great progress in some areas, but a great loss in others such as architectural quality which assumes that a small amount can be adapted.

In China, in the beginning, I was always angry, I changed things all the time and it was unsatisfactory. But when I realised that I could ask the Chinese to change things, it was very pleasant. However, this element is likely to die out in China.

Q. : *In what areas do you use IT tools in your projects ?*

P. A. : All architects now use IT and especially the Autocad programme which has become universal. Other tools used for representation, manufacture and simulation of volumes and objects in 3D have become an essential way of communicating with other people to show

each other what they are doing. And all this despite the problem inherent in handling images, because images are a lie, they are not reality.

In manufacture, IT tools are eminently useful because they solve complex problems, help to manage and organise multiple data, and above all bring new possibilities to implementation because all these to-scale drawings are created by machines which are computer-operated.

Are these elements of creation ? I do not think so because these tools are too slow. My hand works a lot faster when I am looking for something and the computer's precision does not help me at all. However, on the other hand, drawings I make find substance in imprecision and even prompt one to find the desired shapes. Computers are too precise and when they are structured not to be so, they are standardised in their imprecision.

They are wonderful tools for verification but they are also dangerous because they may end up imposing their own methods on their users. They are very structured internally and so one has to have a great deal of determination to impose ones' own ideas on them.

Q. : *Does the evolution of architecture and the sophistication of structures mean that architects are engineers, like you ?*

P. A. : No. As far as I am concerned, I have more of a scientific than engineering background. Science inspires me and I think that there are few differences between scientific and artistic reasoning. On the one hand, one agrees on collective rules of falsification ; on the other, what is true is open to the individual. However, through the process of work and discovery, the approach is the same.

The number of areas of engineering is such that you would never monitor them all. However, if one looks at it from a scientific point of view, one can understand the problems raised and find the people who will help you solve them. Architects should not loathe scientific subjects which tend to be the case for most of them. In this profession, if everything were uniform that would be a real loss. Architects must have different training and contrasting backgrounds. It is as important for an architect to read poetry and look at paintings as it is to know about astronomy.

Presentation of the speaker :

Paul Andreu : architect and engineer. He worked for more than thirty years for the *Aéroports de Paris* (ADP : Paris Airports) where he was in charge of architecture and engineering. When he left ADP in 2003, he created his own architecture company in Paris which enabled him to open a new angle to his work. His latest achievements include the Oriental Art Center in Shanghai, the Grand National Theatre of China in Beijing and the Science Enterprising Centre in Chengdu. All these projects have helped strengthen the current relationship he enjoys with China.

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