Photographer: Serge Picard

Gardens in the sky

Paris is about to become home to the largest vertical garden in the world. It is the brainchild of **Patrick Blanc**, a botanist who has been perfecting the art of growing plants on walls for 40 years. He tells **Laura Spinney** how he developed the tricks and techniques of vertical gardening

Is that green algae growing under your fingernails?
No, I've just come from my latest vertical garden, which covers the administrative and research building of the new Museum of First Arts here in Paris. I've been removing dead leaves.

You turn down a lot of requests to create vertical gardens. Why did you accept this one?
The museum, which opens in 2006, is about diversity in human creation. I wanted to respond by showing the diversity of creation in the plant world. That in itself was a tall order. I have used 15,000 plants from 150 species taken from North America, Europe, the Himalayas, China and Japan.

How do you feel, watching them grow?
They're my babies! I was very afraid for them at one point, because the watering system stopped working, but they seem to be growing well. In a couple of months they will be spectacular.

You have green highlights in your hair, and a jungle with birds and lizards in your house. How did this obsession with plants begin?
As a kid of 8 I had aquaria in my bedroom at my parents' home outside Paris. I read in a German fish-keeping journal that it was good for fish to have plants in their aquaria, to act as filters and to provide them with a natural-looking ecosystem. So I added aquatic plants such as philodendra and cryptocorynes, and quickly became more interested in them. The problem of finding the optimum conditions for the plants was far more subtle and complex than for the fish. In the end my philodendra outgrew the aquarium, so I had to invent a watering system in which I pumped water out of the aquarium, through the support structure made of glass wool that I had erected for the plants, and then back to the aquarium.

Patrick Blanc was born in Paris in 1953 and made his first trip to the tropical rainforests of Malaysia and Thailand at 19. In 1988 he patented the technique for growing vertical gardens that he had started developing as a child, and a year later he took a doctorate in botanical sciences in Paris, writing his thesis on the plants of the tropical rainforest floor. In 1994 he introduced his vertical gardens to the International Festival of Gardens at Chaumont-sur-Loire. After that commissions started to pour in. He is a scientist at the French national research agency (CNRS) in Paris, and an expert on shade-dwelling plants of tropical forests. His book on the subject won him the French Prix Virgile in 2003.

And so the vertical garden was born?
That's how it started, but I gradually refined it, and the system I patented in 1988 was more sophisticated. Now I cover a wall with a light metal frame, leaving an air gap between the wall and the frame. A PVC sheet goes over the top of the frame, and then I staple a layer of special polyamide felt to the PVC. The felt is irrigated, and it plays the part of humus and mosses covering a rock. It sucks up water by capillary action and retains it, supplying the plants that I then plant into holes in the felt. Think of epiphytes in a forest, the plants that grow on other plants. They have their roots superficially embedded in tree trunks. It's the same for plants growing on rocks. I simply tried to recreate that superficial way of life.

Did it take off?
Yes! First, I made vertical gardens in my own home, then in my friends' homes. In 1994 I was invited to show my work at the International Festival of Gardens at Chaumont-sur-Loire in France and it was a hit. After that, many people asked me to make plant walls for them. At first it was private clients, then architects, companies, bigger and bigger projects. When I was in my bedroom at my parents' house, I never dreamed I would one day cover such large surfaces.

Has it made you rich?
I earn a lot, so I should be very rich, but I'm not very good at managing my money. For the last two months I have employed an accountant, so perhaps things will improve now.

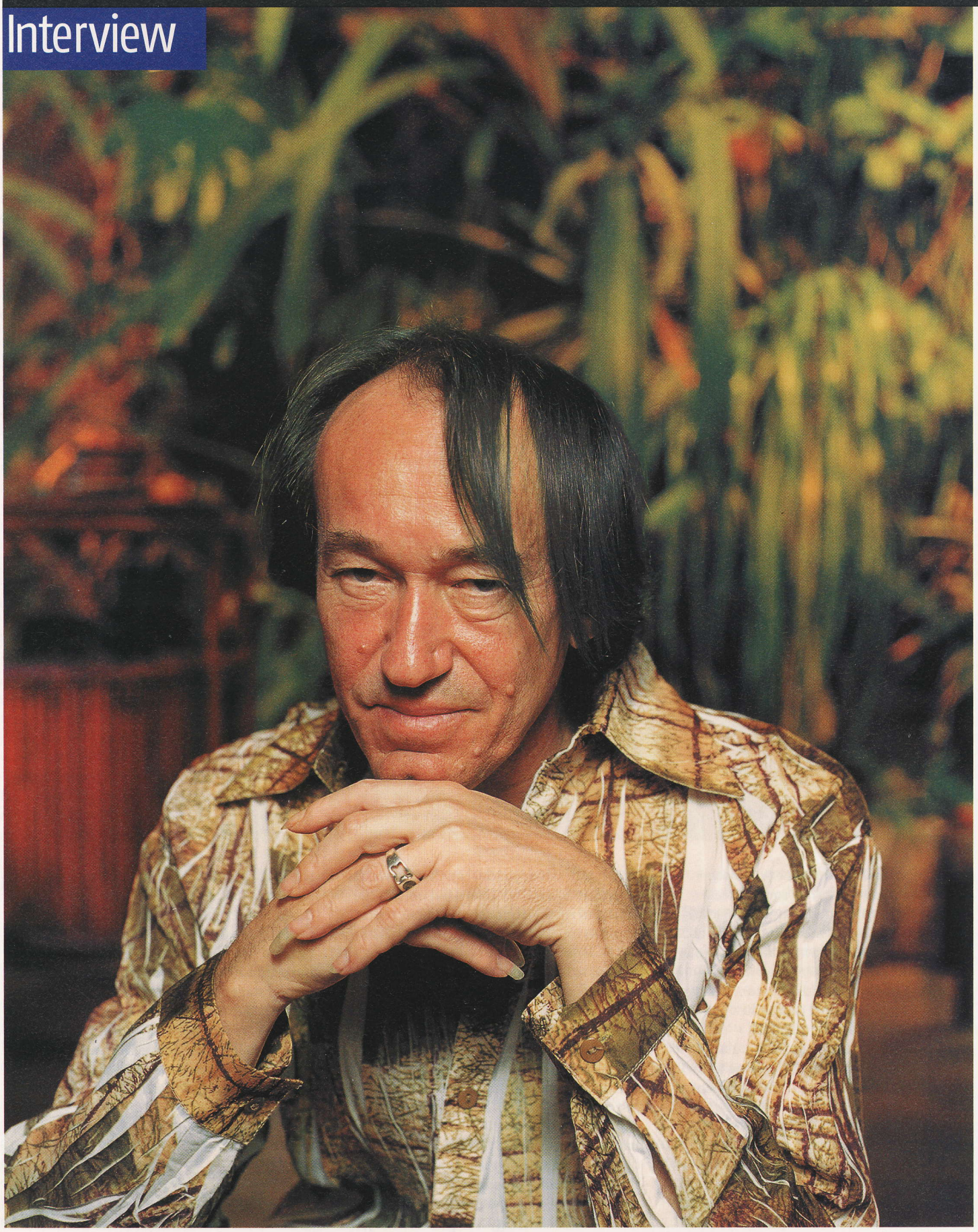
When did you see your first tropical rainforest?
In 1972, when I was 19, I went with my parents and a friend to the forests of Thailand and Malaysia. We stayed in huts in a national park – the same national park, in fact, in which two people were mauled to death by tigers in 1998. But in 1972 there was barely any tourism in the area and we were unaware of the danger. There I saw the plants I grew at home, that my mother and I used to go and see in exhibitions in Paris. All the time I was nurturing them in my bedroom, I never knew they grew naturally on tree trunks, rocks and in small rivers in the rainforest.

Think of the rainforest and you tend to think of towering trunks draped in vines. But you were drawn to the understorey, the plants growing just above the ground. Why?
I agree it sounds less glamorous. But with a tree you're always guessing: you can't see the canopy, you don't know how far the roots extend. It's different with a small plant. You can see all the organs – the stem, the leaves, the fruit – you can understand the whole biology. For me, trees are merely protection for these plants, their habitat and support. They are more like pillars of concrete than living things.

How do you divide your time between your science and your art?
I'm a researcher first and foremost, but I fund most of my expeditions myself. I travel all over the world, making my plant walls, and as far as possible I build my research into those trips. So after three days' work in Tokyo last autumn I was able to spend 10 days in the forests of southern Japan. And last week while I was making a TV programme in Socotra, an island in the Indian Ocean that belongs to the Republic of Yemen, I managed to fit in some research too. Socotra is a fascinating place. It is mainly desert and shrubland, and it has some highly specialised, plant species, 250 of which are only found there.

The rainforest can be a dangerous place. Have you had any close shaves?
I've had most of the tropical diseases. CNRS, the French national research agency, has a research station in Nouragues in French Guiana, where I go often. Once I was in the forest there photographing a small fern. I parted the leaves and 5 centimetres beneath my ▶

AGENCE VU



SERGE PICARD/AGENCE VU

hands was a species of *Bothrops*, one of the deadliest types of viper. It didn't move. Snakes in the rainforest don't move when disturbed because unlike savannah snakes they can't sense a footfall. Another time I was wading down a small river and I reached for a branch that was in fact another poisonous snake. I saw it just in time. But adventures? I don't know. I'm still alive.

What fascinates you about the plants of the understorey?
Their endless creativity. Because they have to adapt to the environment in which they live, because they cannot move to another place, they are necessarily very inventive. Plants in the understorey receive on average only 1 per cent of the light that hits the canopy. Energy is in short supply, but building woody stems demands a lot of energy. It involves the transformation of sugars, and some of these plants have come up with ingenious ways around this. There are plants growing close to waterfalls, for instance, whose stems are filled with water instead of wood. The water gives them rigidity and they save on energy, so they can continue to grow fast. It's just one of many creative morphological solutions these plants have come up with.

So you can have eccentric plants just as you can have eccentric people?
In the sense that there is no single morphological response to a given environment, but many, many different responses, yes. But more importantly, I've learned that it isn't always the biggest, most powerful plant that wins. For instance, a larger plant has larger seeds, which fall to the ground and germinate right there. Their weight means they slide to the bottom of any slope. But a smaller plant has lighter seeds, and these are more likely to come to rest higher up the slope, or on a rock. By virtue of being smaller and lighter, they exploit a niche that is inaccessible to the bigger plant.

"There are plants that grow close to waterfalls whose stems are filled with water instead of wood. The water gives them rigidity"

You're writing another book now. What is it about?
It's an essay really, a comparison of plant, animal and human behaviour. I'll give you an example. Something like what I have just described also happens in animals. People have studied monkeys and found that it isn't always the alpha male that inseminates the females of a troop, because he is too busy being dominant and looking out for everyone. Often the smaller, peripheral males find more chances to mate, having fewer other responsibilities. You could call that a form of creativity too.

What about humans – can we learn anything from the plants of the understorey?
Well this will certainly be seen as provocative, but in my new book I argue that globalisation is the enemy of human diversity.

How?
In 20 years of study I've realised that these plants cohabit peacefully, they don't compete. They adjust their height to match the height of surrounding plants, including plants of other species. That way they don't overlap and they all get their share of the limited light. When light becomes more plentiful, that's when competition kicks in, because the differential in growth rates increases, and the faster-growing species block out the smaller ones. That's bad for biodiversity. Now, imagine the light were shared more equally between the canopy and the understorey – the rainforest equivalent of globalisation, perhaps. That would be good for competition on the forest floor, but the more dominant species would win out, while the weaker ones would fade away. Result? Loss of diversity. I'm afraid something similar could happen to those human cultures

that have become adapted to surviving with limited resources.

Do you find the plants you study beautiful?
Oh there is great beauty down there. Where light is scarce, plants can't afford to have their leaves overlap each other. There are mechanisms to do with the transmission and reflection of light that regulate the positioning of leaves in space as they grow. The situation can even arise – I've seen it in French Guiana – in which you have two plants of different species entwined, and their leaves form a single crown without overlapping each other. This need to avoid superposition drives a kind of regularity of design – an axial or lateral symmetry – that I find very beautiful.

Why are your fingernails so long?
They've been long since I was a child. As a boy I loved Edith Piaf, the singer, and she had very long nails, so in part it is a homage to her.

Don't they get in the way?
Last week, in Socotra, I had to climb rocks, and the people working with me said, but you'll never be able to climb with those nails. I told them no problem, if they break they break. They will grow again. I have been involved in a project in west Africa to study the forest canopy from rafts that are placed on top of it. That involved climbing between 30 and 40 metres up a rope. My nails don't stop me reaching difficult places.

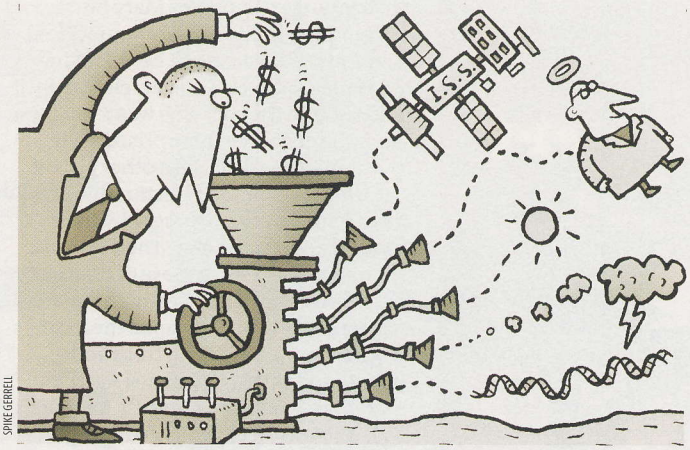
Would you live in the jungle?
No. I like to be in the forest but I prefer to live in a town. I'm a human being, not a plant.

What's the next project?
While I was in Tokyo last year, working on an installation at the Museum of Contemporary Art, a man approached me and asked me to cover his building. His building is 70 storeys high, which is around 150 metres. So at the top it is windy, while lower down it is more protected, and I will have to choose my plants and position them accordingly. That will be quite a challenge.

Is there any vertical limit to what you can do?
No, because my system is very light. You could say, the sky's the limit.

Washington diary

Andreas Frew, alias Chris Joyce and Joe Palca from the science desk of NPR (National Public Radio) in Washington, have given us the inside story on the American political scene since 1994. This is the last of their regular bulletins



SPIKE GERRELL

THERE's an old saying that people who like sausage should not watch how it is made. In Washington, cynical policy wonks say the same about people who like legislation. Certainly anybody committed to rational thought will experience a certain queasiness at the sight of legislators twisting science to fit their Procrustean beds of political or religious ideology.

And where ideology cannot win out over science, money certainly can. Congressional support for the "big science" project known as the International Space Station is strong not only because the ISS might deliver fantastic scientific dividends – a prospect even ardent supporters have to admit is in the unforeseeable future – but because virtually every state in the Union is home to a contractor who makes some kind of widget for the space station, thereby bringing money and jobs to legislators' home districts. And if that is not enough, the aerospace industry is always happy to contribute to a legislator's favourite charity.

What politicians in Washington get in return for funding science and technology are poster children, heroes usually, as in NASA engineers who build shiny machines with the American flag pasted all over them, or medical researchers who sequence the human genome. Occasionally politicians use scientists as their whipping boys as well, as in geologists who come up with the "wrong" opinion on where to bury nuclear waste or why the Earth's climate is changing and who is responsible.

What scientists need to remember is that no matter whether they are cast as heroes or villains, they will not be truly understood. Think back to school days. The kids who grew up to be politicians are the same ones who played on the football team, failed chemistry and made fun of the geeks in the science class. You will always be an alien to them.

Still, if the process is endlessly frustrating to the rational mind, it is also endlessly fascinating. Somehow budgets for important scientific projects get passed, somehow important research is allowed to go forward despite religious objections, somehow the US scientific enterprise, largely funded by the federal government, remains the envy of the world.

Over the decade that we have been writing this column, we have tried to share some of the silliness and some of the triumphs of the American scientific process. We promise to report back when we see the truly egregious or the truly commendable. Bye until then.

ENIGMA 1342

GOSH

Susan Denham

The latest work at GOSH, the Gallery of Shocking (H)artwork, consists of a straight line of pins nailed into the floor. The second pin is one centimetre from the first and (continuing in the same direction) each pin was as close as possible to the previous pin so that it is a whole number of centimetres from it and no pin is exactly mid-way between two others.

The total distance from the first to the last pin is between four and eight feet.

How many pins are there in this work of art?

£15 will be awarded to the sender of the first correct answer opened on Thursday 30 June. The Editor's decision is final. Please send entries to Enigma 1342, New Scientist, Lacon House, 84 Theobald's Road, London WC1X 8NS, or to enigma@newscientist.com (please include your postal address). The winner of Enigma 1336 is Gary Gerken of Sunnydale, California, US

Answer to 1336 Rectangles
The dimensions of the piece of paper are 10 inches x 13 inches.