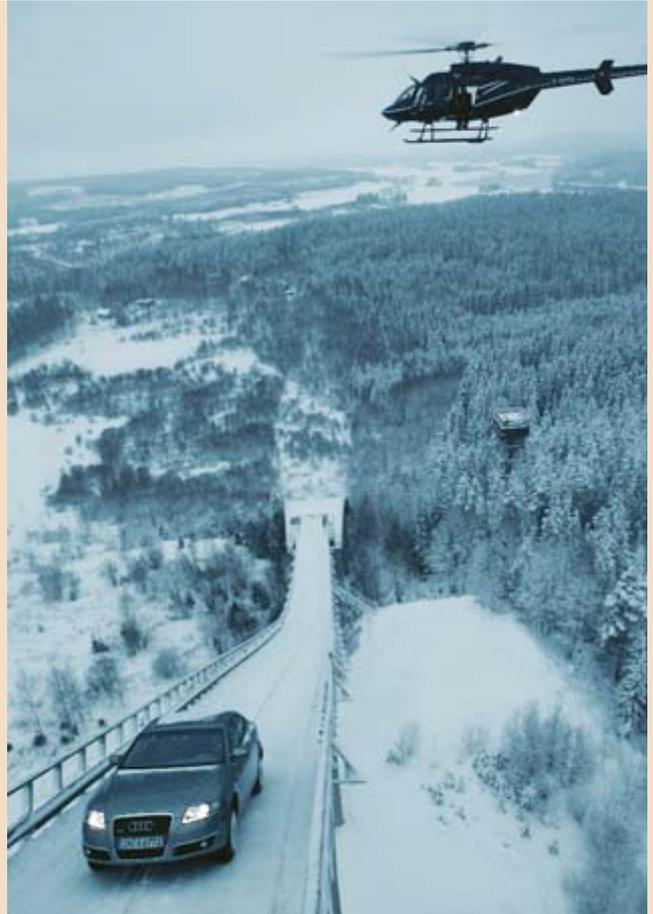


## Remake of the Audi ski jump commercial

An 80 percent incline, temperatures well below zero. Somewhere in northern Finland, an Audi stands on the base of a ski jump. Facing uphill, ready for a very special kind of challenge. This would not be the first time an Audi had conquered the ski jump. 20 years ago, an Audi 100 CS achieved precisely that – climbing the slope with the power of its four wheels alone. Now, to mark “25 years of quattro”, it was time to shoot a sequel to the legendary ski jump commercial. The car in the starring role this time: the Audi A6 4.2 quattro\*. And for the second time, quattro drive succeeded in conquering the ski jump. The A6 drove effortlessly up the 80 percent gradient at about 60 kilometres an hour. After just nine seconds, it had reached the ski jump’s starting platform, coming to rest 47 metres above the frozen forest ground. The A6’s ascent was observed from a helicopter, serving as a vantage point from which the remarkable feat was captured on film. The spectacular results were broadcast from March 2005 in the “25 years of quattro” TV commercial.



## Duel on ice

Man versus machine, two muscular legs versus four driven wheels. A rather unusual duel took place on the skating rink in Berlin-Hohenschönhausen in March 2005: Olympic champion ice speed skater Claudia Pechstein accepted the challenge to race against an Audi RS4\* driven by DTM driver Frank Stippler. The 33-year-old skater accomplished the 900-metre course in an impressive time of 1:15:81 minutes. But with only the blades of her skates to grip the ice, she stood little chance against the 420 bhp (309 kW) horsepower of the Audi RS 4. Stippler swooped confidently round the icy bends, crossing the finishing line after only 1:13:67.

## Gathering of experts

Football matches are traditionally analysed by self-styled experts in pubs up and down the country. Latterly, the Audi Forums in Ingolstadt and Neckarsulm have been playing host to professional pundits by doubling up as the studio for “Doppelpass”, the football programme on the German channel “DSF”. During the Bundesliga season, leading football experts such as Udo Lattek and Felix Magath appear on the Sunday talk show hosted by Jörg Wontorra to review the weekend’s games.



## Winter wonderland in Ingolstadt, DTM in Neckarsulm

The Piazza of the Audi Forum in Ingolstadt: normally a recreational area for the many thousands of visitors and customers collecting their new car. But as soon as the temperatures head towards zero, the Piazza is transformed into a fairytale winter wonderland. Where better to celebrate “25 years of quattro” than on ice and snow? The Audi employees congregated at this icy setting in February 2005 for their very own workers’ day. For fans of drifts and lateral acceleration, racing driver Emanuele Pirro demonstrated spectacular manoeuvres in an Audi RS4\* on a vast ice rink, before visitors were given the opportunity to try out their ice skates. For those preferring grass pitches to slippery ice, FC Bayern Munich footballers Sammy Kuffour, Roque Santa Cruz and Vahid Hashemian were there to sign autographs. Technology enthusiasts were able to take a closer look at an Audi A4 cut open lengthwise and an aluminium space frame, as well as the Audi brand group’s current model range.

A day’s celebrations for Audi employees at Neckarsulm followed in autumn 2005: the site of the Audi Forum in Neckarsulm was transformed into a racetrack on which Audi DTM drivers demonstrated overtaking

manoeuvres and pit stops with wheel changes in racing cars developing more than 460 bhp.

As well as the roar of engines, gentler tones filled the airwaves, too. Xavier Naidoo captivated the 40,000 visitors to the workers’ day with a one and a half hour long concert of expressive German soul.



\* fuel consumption figures at the end of the Annual Report



He is known as “The Ear”, the master of perfect sound. At first he was only mildly enthusiastic about the task of creating a car hi-fi system – until he got to know the Audi A8. A visit to see Geoff Martin, one of the fathers of the Advanced Sound System.

# Geoff

When Geoff Martin looks out of the window, he sees lush green meadows, grazing sheep and the cobalt blue Limfjord nearby. The Canadian is a sound engineer at the Danish hi-fi specialist Bang & Olufsen, whose name enjoys an excellent reputation worldwide. Yet there is little evidence of the big wide world in this modest little town. Here in Struer, a community of some 11,000 inhabitants “in the middle of nowhere”, or in north-west Jutland to be more precise,

Bang & Olufsen ticks along to a harmonious rhythm, without the slightest hint of ear-splitting beats: this is not how pulsating life looks. And yet – this is where the most advanced high-end systems in the world are created, including the Advanced Sound System for the Audi A8.

We have come in search of the man whose acoustic signature is on the 1,100-watt acoustic marvel in the Ingolstadt carmaker’s

# in Ideas Land



flagship model. His astonishing ear for acoustics earned him the privilege of “spending three months living in the A8,” as he puts it. He has a doctorate in sound engineering and is therefore a musician, studio technician and programmer rolled into one. He completed his undergraduate pipe organ degree, including choral conducting and ear training, at the Memorial University of Newfoundland.

mare. The car body acts as one huge, dull acoustic object, and the driver and front passenger are always seated too close to one of the speakers for the sound pattern to be symmetrical. But the biggest problem is the constantly changing driving noise that is superimposed on the music.” The ambitious challenge facing the premium system from Bang & Olufsen was to make it possible to experience perfect sound in this acoustically hostile environment.



Geoff Martin in the sound workshop. In the background: Bang & Olufsen’s top speakers, on whose technology Audi’s Advanced Sound System is modelled.

The exclusive Danish brand boasts decades of experience in the use of aluminium. The speaker covers for the A8 are finished to a precision of hundredths of a millimetre.

The sign on the frosted glass door in the unassuming red brick building, tucked away behind the glazed facades of the main building, says “Ideas Land”. Here, at Bang & Olufsen’s powerhouse of ideas, is where we have arranged to meet Martin. It is in the oldest part of the plant that the visions of the future take shape; this is where the company’s designers and creative specialists are at work.

Martin awaits us with a roguish smile. The man is wearing a knitted sweater, jeans and designer glasses. “How the devil did you find me?” he grins, alluding to the remoteness of Bang & Olufsen’s main base. The Canadian knows how to keep an audience. Unworldly is the last word you would use to describe him, and yet he lives in his very own acoustic world. He seems to treat certain facts that ought to be downright obvious as rather tangential. When asked how old he is, he counters with a question of his own: “What year is it?” We reply: “To the best of our knowledge, 2005...” Martin: “2005? (Pause.) OK, then I must be 36.”

**“I’d always regarded a car radio as the epitome of poor sound.”**

Geoff Martin is an expert in flawless studio sound. When Bang & Olufsen recruited him for the Audi A8 project, he had quite a few reservations. “People who’ve worked in studio technology tend to be quite snobbish,” explains Martin. “I didn’t have high expectations of the sound in a car. To be honest, I’d always regarded a car radio as the epitome of poor sound.” Peter Blum, Head of the Advanced Sound System project at AUDI AG, understands why he had such reservations: “The acoustic conditions in a car are actually a night-

The teams at Bang & Olufsen and Audi already had three years’ development work behind them when Martin came on board. The system’s technology was mature and it had already been tried out in the first few vehicles. Martin was to take care of the fine-tuning. At first he worked exclusively with Bang & Olufsen’s acoustics engineers; communication with colleagues in Ingolstadt was done by phone and computer. After a few weeks, Martin packed his suitcase and flew to Germany. He wanted to speed up the exchange with his counterparts at Audi. And he wanted to experience the product at closer quarters.

The Canadian clocked up countless laps at the AUDI AG proving ground. And even more kilometres on the autobahn during the three months he spent in Bavaria. He was often accompanied on these trips by his counterpart at Audi, sound engineer Wolfram Jähn. Martin explains: “First of all we had to eliminate all sources of noise interference. Wolfram has an amazing sense of hearing, nothing escapes him. We completed an untold number of trips together, listening closely while accelerating, braking or driving over different types of surface. Whenever we detected noise disturbance, we took the car to pieces and rectified every part that was causing undesirable vibration.”

The things that Martin and Jähn deemed “a disturbance” are virtually imperceptible to the ordinary ear. One day, when working indoors, they scoured every millimetre of the A8’s interior in search



of a rattling noise that they were detecting when the system was reproducing particularly high notes. The source actually lay outside the car: both men had picked up the trembling of a light bulb on the ceiling of the room they were working in, through the car's closed doors.

Acoustic "cleansing" of the car was the first step. But their real work began once there was no longer anything to distract them from



A technician fits the covers for the door speakers.

The perforated aluminium shells are then tinted to match the interior colour.

the system's sound. Together, the engineers had to define what "advanced sound" actually means: probably the biggest challenge that the team faced. "At first, the live experience was my ideal," comments Martin. The Ingolstadt-based team of Blum and Jähn, on the other hand, had clear notions of what qualified as the sound of an Audi model, and what did not. "Particularly at the beginning, our different ideas clashed. Sound is something utterly subjective. Everyone experiences a piece of music differently and concentrates on different aspects. What's more, our response to sound is very emotional," adds Martin.

**"Our response to sound is very emotional."**

And perfect sound – what does that sound like? Back in Ingolstadt, Jähn described to us how he listened out for the naturalness of notes. He goes into raptures about the "transparency" of the system's sound: "The Bang & Olufsen system enables you to hear the wood of a percussion instrument. With guitar music, I hear the twang of the strings and the contact of the fingers before they are plucked. That opens up entirely new dimensions!"

In the frenzied final phase, Jähn set out on test drives all over Germany, complete with his private CD collection in tow. "Those trips were incredibly exciting. The Advanced Sound System is a true mentor, it trains the ear. You suddenly discover pieces that you thought you knew by heart in an entirely new light."

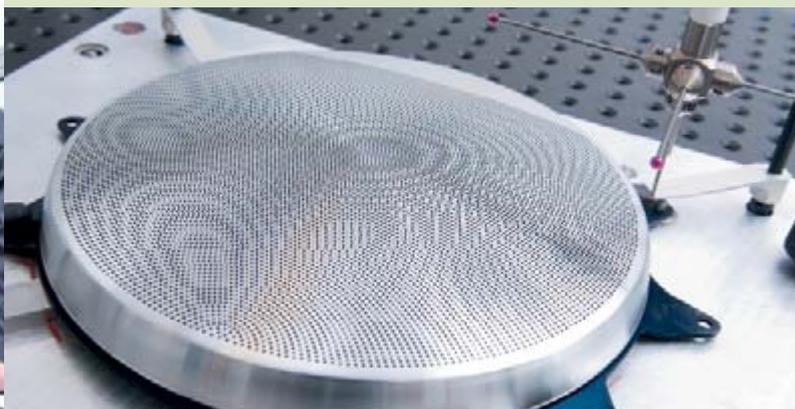
Martin the studio professional was able to contribute his appreciation of acoustic three-dimensionality, the precise positioning of the instruments and singers in the room. "Perfect sound: for me, that means getting as close as possible to the live experience. At a classical music concert, I have to be able to picture the orchestra in front of me, with my eyes closed. The stage has to be acoustically right in front of me, with all the instruments arranged in order."

## The Advanced Sound System of the Audi A8 at a glance:

- ▶ 14 speakers
- ▶ Speaker grilles in anodised aluminium
- ▶ 1,100 watts output
- ▶ Two amplifiers: one classic linear amplifier and one switching amplifier (ICE Power)
- ▶ Digital Sound Processor (DSP)
- ▶ Surround sound reproduction



Summit talks at Audi: Martin Winterkorn (left) and Torben Ballegaard Sørensen (2nd from right) discuss the final details of the Advanced Sound System with technical and marketing experts.



- ▶ Two acoustic lens tweeters which are automatically extended from the instrument panel when the system is activated

It had hitherto been technically impossible to realise the sheer acoustic power of a studio recording in a car until the combination of DSP (digital signal processing), ICE Power, a new type of amplifier technology, and the acoustic lenses from Bang & Olufsen's

BeoLab 5 speakers came along.

**"Perfect sound: for me, that means getting as close as possible to the live experience."**

"A car hi-fi system was virgin territory for both Bang & Olufsen and myself as a studio engineer. Perhaps that is why the system turned out to be so innovative.

Throughout the entire process I sought above all to raise expectations of an in-car sound system and push up the benchmark. For me, that benchmark was ultimately not the music system of another car, but the best sound that Bang & Olufsen has ever produced in the sphere of home entertainment." The results are certainly there for all to hear! | *Eric Felber*

Throughout the entire process I

### What is ICE Power?

ICE Power combines the advantages of the classic linear amplifier with the benefits of the switching amplifier. For instance, a linear amplifier with an acoustic output of about 250 watts generates around 500 watts of heat in the form of power dissipation. This high power dissipation is a problem in a vehicle, because this is power that first has to be produced by the alternator and then cancelled out again by the air conditioning system. If a switching amplifier is added to the system, the power dissipation is reduced to 50 watts.

### What is a lens tweeter?

The acoustic lens tweeters combine the freedom from tonal discoloration of tweeters with the pulsed reproduction of horn speakers. The way the sound is guided by the lens is also very important. This prevents the reflections that used to occur, thus guaranteeing a new quality of spatial reproduction.

## Two men in tune with each other: Martin Winterkorn, Chairman of the Board of Management of AUDI AG, and Torben Ballegaard Sørensen, President and CEO of Bang & Olufsen a/s, are on the same wavelength. Not just as a result of their partnership for the Advanced Sound System in the Audi A8.

What can have inspired each of them to sing the praises of the other so highly? Sørensen says of Winterkorn: “He is a very straightforward person. That, combined with his considerable expertise, makes him a person who keeps a project moving forward and transforms visions into reality.” And Winterkorn says of Sørensen: “I was profoundly impressed by his views of innovative technology, excellence in design and superlative quality, and how he implements them within his company.”

“I have already spent hours at the aluminium workshop in Struer. It’s utterly fascinating what they achieve there,” enthuses Winterkorn. An engineer by background, he studied metallurgy, so metallography is something of a hobby-horse to him. Sørensen has fond recollections of meetings that were moved into the production shop following the brief preliminaries: “Winterkorn is just like me, he is passionate about his field. He would look over our employees’ shoul-

## Two men on the same wavelength



The brands Bang & Olufsen and Audi have much in common, too. This is illustrated by the way the Advanced Sound System came about. Without any prior arrangement the Danes started work on realising the crystal-clear sound of a Bang & Olufsen home system in a car. They installed the prototype of such a system in an Audi A8 and then presented the results to Winterkorn in Ingolstadt. But why choose Audi? “Our designers were adamant about that,” explains Sørensen. “They chose this brand to demonstrate their development because of their respect for Audi product quality and design.”

When the team from Bang & Olufsen presented its results, their counterparts at Ingolstadt were instantly captivated. “B & O demonstrated to us what was possible – and whetted our appetite for more,” adds Winterkorn. “The prototype was highly impressive – pure emotion even in its first unfinished version.” The man at the helm of Audi espoused the cause as his personal mission. “The best premium cars in the world also deserve the best sound system in the world – that was what I wanted to demonstrate.”

As well as their philosophy – premium quality and innovation – Bang & Olufsen and Audi also have a core skill in common: both manufacturers are experts in the field of aluminium processing – a subject that is particularly close to Winterkorn’s heart. While Audi focuses on lightweight construction technology using high-strength alloys, Bang & Olufsen is above all interested in the metal’s surface finish.

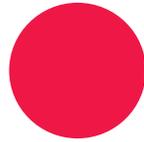
ders while they worked, and have every step explained to him in detail. We then jointly decided on the surface structure and colour of the speaker covers there and then, at the plant.”

The acoustic acceptance process for the sound system was a similar affair. “I took a seat in the A8 and could have believed I was in a concert hall,” remarks Winterkorn. “Mr. Sørensen and I chose a few pieces of music, then listened to them together in the A8. There was some Santana, and a few classical pieces. But the one that really stood out for me was a fantastic live recording of ‘Hotel California’ by The Eagles. The sound quality was phenomenal. When I was flying back to Ingolstadt, I knew that I simply had to have a Bang & Olufsen system at home, too.” Sørensen adds: “I had a similar experience in Kitzbühel. Last winter I took part in an Audi Driving Experience, to learn how to drive on snow and ice. It became clear to me that my next car just had to be an Audi with quattro drive.”

A harmony that is almost eerie. The two CEOs wonder whether this spontaneous affinity between them has its origins in their similar experiences as young drivers. As chance would have it, the two men once happened to swap notes on their first car radios. Winterkorn explains: “The radio in my Beetle basically produced nothing more than a crackle on VHF, interspersed with the odd note of music. So I usually had to listen to medium wave.” Sørensen adds: “And my 2CV was so noisy that you couldn’t hear the radio at all.” So even unpalatable experiences can foster fruitful partnerships. | *Eric Felber*

# Tokyo by memory

Reportage on how a taxi driver negotiates  
the jungle of Tokyo's road network



Driving a car in Tokyo can soon turn into a nightmare. Even for many taxi drivers, finding their way around a city where most streets do not display names is no easy matter. Many of them get their passengers to guide them through the megacity to their destination; others rely entirely on electronic navigation systems. Only few of them know the city so well that they can set out without a map and on-board computer. Tooru Hakomori is one of this rare breed.

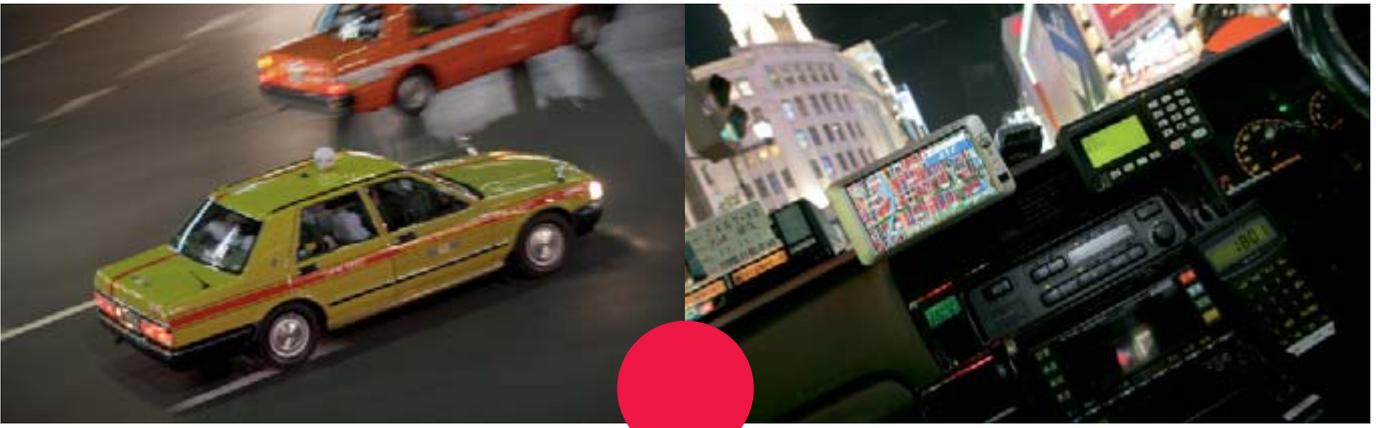




Born in the centre and having grown up on the edge of Tokyo, he has been driving a taxi for ten years, always for the same company, and has never had an accident. He chauffeurs sports stars and TV celebrities, passing trade and regular customers. His order books are full, and his shifts already spoken for. He took the aptitude test at the start of the 1990s. Traffic code, first aid, local knowledge. Child's play, he says. Hakomori has since been the proud driver of a saloon taxi. The city is his workplace, and preoccupies him night and day.

The Ginza, Tokyo's most famous shopping street: abuzz with traffic every hour of the day or night. The Ginza also means business for Tokyo's taxi drivers – anyone who can afford to shop here can also afford to hire a taxi.





Tooru Hakomori knows Tokyo by memory. All of Tokyo. Every district, every street, every lane. Quite a feat in this metropolis of 30 million inhabitants, where a single district is often bigger than the whole of Frankfurt and the streets rarely display names. He knows the big junctions and the narrow rat runs; he knows where and when the traffic is heaviest, and how best to avoid it. His taxi is yellow, his suit black, his tie grey-striped. He wears gloves that are so white that they look as if they are fresh from the cleaners. Hakomori drives in style. But he is not the only one to do so.

Tokyo's taxi drivers are the best-dressed in the world. It can be a complete nightmare out on the multi-level highways and the megacity may be transformed into a perfectly organised chaos at rush-

hour, but the immaculately dressed chauffeurs of the common man can always be relied on to keep up appearances. They are never to be seen wearing pullovers and jeans, but are always clad in jacket and tie. In a society that sets great store by status, every flaw costs customers. The driver only speaks if he is spoken to, only switches on the radio if the passenger so wishes, and will put on a film in the DVD player if requested. But competition is tough, the market tight and the competition razor-keen. Hakomori looks tired. He must be on one of those eighteen-hour shifts that are commonplace in his line of business here. One day on, one day off – every month. Business is best early in the morning and late at night, when a fare to Yokohama or Chiba is nothing unusual. That's when he can clock

## Intuitively to your destination

Programming destinations, changing radio stations, phoning – Audi A6 and A8 drivers can manage entertainment and information via a compact control panel on the centre console. In the guise of the Multi Media Interface (MMI), Audi has created an integrated operating concept that makes it easy to control vehicle and infotainment components. The MMI consists of the MMI terminal in the centre console and the MMI display, a screen in the instrument panel. The central element of the terminal is a combined rotary control/push-button with four control buttons arranged around it. An integral voice control brings added convenience. "For all the potential complexity of its functions, our development priority was ease of operation," explains Dr. Werner Hamberger, developer at Audi. The driver is consequently in a position

to control all functions intuitively – and can therefore concentrate on the road. The navigation system is integrated into the MMI. The system features dynamic route guidance and takes account of all current traffic reports in calculating a route. Navigation DVDs are available for a great many regions of the world. Audi presented an innovative means of navigation at last year's Tokyo Motor Show. Drivers could soon be able to find their way to their destination via touch screen. They can activate the basic architecture of the MMI screen directly by touching the function panels in the display. And they will no longer need to program in destinations one letter at a time, because they will simply be able to write a destination on the monitor with their finger. Audi's developers are facing a veritable challenge in adapting these systems to the

specific requirements of individual markets. In the USA, for instance, it is customary to enter the street name first rather than the destination town or city. In Japan, the Latin alphabet cannot be used but there are simply too many kanji characters in Japanese for it to be practicable to incorporate them in a user-friendly manner. Audi therefore uses a phonetic alphabet of around 50 characters that is widely used in Japan. Meanwhile in China, where the market launch of the navigation system is scheduled for the first quarter of 2006, there is no such alphabet. Someone in Shanghai or Beijing therefore makes an input using the English phonetic alphabet that is customary there. A principle that the Chinese are already familiar with – for example when typing on computers or texting with mobile phones.



A new quarter has been built between Tokyo Bay and the Hama Rikyu Gardens: Shiodome was home to the station on Japan's oldest railway line, which links Tokyo and Yokohama, for almost a century. A few years ago, the district was redeveloped as a business quarter. Media companies in particular have now moved in. Together with the skyscrapers, the rebuilt old station is one of the attractions of Shiodome.

Consisting of several thousand characters, the Japanese and – pictured here – Chinese alphabets pose a particular challenge for the MMI operating system.





up a decent distance and make money. Others know that, too. Each day, there are sixty thousand taxis on Tokyo's streets – ten times more than in Berlin, and five times more than in New York.

### High-tech and lace covers

Unlike elsewhere, every taxi here is an immaculate affair with enough high-tech to run a whole office. The first surprise is the rear door: it opens even before you can take hold of its chrome handle. The next surprise is the rear seat: it is decked in finely worked lace covers reminiscent of your great-grandmother's sofa. The air carries a fresh scent of jasmine. The floor mats are softer than a Berber carpet. The engine growls like a teddy bear.

Once Hakomori has set off in his doll's house on wheels, he gets a move on. Clutch, accelerator, first gear. The car pulls away. The taximeter starts to run. Minimum charge: 660 yen. That includes the first two kilometres. Second, third, fourth gear. He is faster than most, and swifter than the rest. The little green lights displaying the price change rapidly as the fare tots up. All the doors are locked centrally. Tokyo is an expensive place. A watermelon can cost as much as fifty euros in the major stores' delicatessen departments, and a taxi ride through the city twice as much as a gondola trip in Venice.

Hakomori goes with the flow. The wave of traffic is interrupted by red at every set of traffic lights, and set in motion again by green. He drives past the museums of Uneo Park and the gardens of the Imperial Palace at the heart of the city, the huge City Hall in Shinjuku, the Roppongi skyscraper and Tokyo Tower, the main points of orientation. We are now reaching the banking quarter of Marunouchi and the central station, which every day is frequented by more people than live in the whole of Munich. He passes the gaudy neon lights of the Ginza shopping district, the old stone Nihonbashi Bridge and the new Rainbow Bridge, that architectural marvel that leads to the man-made island of Odaiba.

### Top-quality service, but no tipping

It is the location of a Statue of Liberty – a smaller, half-hearted replica of the real thing. Hakomori describes how he has seen the original, tall and beautiful. New York impressed him, though not its taxis. He hailed one of those yellow cabs only to decide after just three hundred metres that he preferred to go on foot. The driver was friendly, but they spent the whole time stuck in a traffic jam with the radio blaring away and the air conditioning off. The leather of the seats was cracked, and when he came to pay up he waited in vain for his change. Inconceivable in Tokyo. Tipping is unheard of here.

The traffic slows down and finally grinds to a halt. Hakomori sits bolt upright behind the wheel, accelerates, brakes and manoeuvres his car with that polite Japanese ruthlessness into every gap that presents itself. He switches from one lane to the next, turns his car at right-angles to the traffic flow, weaves into the long chain of lights formed by the cars and remains constantly on the lookout for a chink of opportunity to edge his way forward more effectively than the rest of the pack. Use of the horn is rare, cursing out loud utterly unheard of. If someone else beeps at him, he does not so much as bat an eyelid and just sits there poker-faced. He turns into a side road.

The traffic is lighter here, the road barely as wide as a farm track. He proceeds down narrow lanes; once or twice Hakomori has to manoeuvre to get round the hairpin bends, before getting back onto the main drag. The door mirrors seem to miss the dark walls and crooked lampposts by a whisker. There are no kerbs; pavements are marked out by pale lines. Houses stand barely an arm's length apart. The streets have no names. The buildings are numbered. Its principal landmarks aside, Tokyo is identified only by numbers, not names. Every attempt at finding your way is something of a guessing game. Yet Hakomori is well acquainted with the city's road network.

Even the municipal authorities have a tough time finding their way around the patchwork quilt of two dozen districts and countless boroughs. The past hundred years have seen the world's largest city spring up across a muddy hotchpotch of paddy fields the size of a pocket handkerchief. The farmers' small patches of land were preserved as their surroundings were developed. Scarcely any old buildings remain, but the site plans are imbued with the spirit of old Tokyo. Newly erected buildings are often numbered according to their date of construction, not their location. Number 59 may be next to number 13. A baffling system that only few can grasp.

Hakomori switches on the high beams and accelerates. He knows where he is heading. He does not need any map, atlas, satellite-based navigation system or traffic management system. He has everything he needs on board. A city guide as thick as a telephone directory in the glove box, a folded-up city map on the front passenger's seat, and a flat screen the size of a paperback book shimmering next to the speedometer. Against a green background, a bright red arrow is edging its way up a bright yellow line. The red marker is the car and the yellow line the road, he explains. He does not so much as glance at either of them. He knows the way without them. He is a child of this city. | *Stephan Finsterbusch*

Composure, a touch of kitsch and a photographic memory for the city's streets enter into a fascinating alliance in the taxi drivers of Japan's capital city. Their self-esteem forbids them from heeding the permanently active navigation system. Or so it would appear to their passengers. A taxi ride is a means of locomotion and a cultural experience rolled into one.



# We are involved from the very first pencil-stroke on

At what point does added value arise within a car company? As early as development – or only when the production line makes a product? Dr. Jochem Heizmann, Member of the Audi Board for Production, believes both areas contribute towards added value. In this interview, he discusses core skills, innovations and a philosophy that runs counter to the trend.



Dr. Heizmann, how far are you allowed to get involved in the development of a new car?

**Heizmann:** It's not a question of being allowed to, but of having to. We are obliged to help with its creation from a very early stage of product development, and that level of involvement is set to rise. Teamwork is essential if a product is to be "production-friendly", satisfy the highest standards of quality and be producible as economically as possible. From a production viewpoint, there are four factors that need to be taken into account in every new vehicle concept: assured quality, production times, investment cost and logistical complexity.

Here's a radical proposal: is it not conceivable that outside service providers could take charge of the production side in future, leaving Audi to concentrate on the development and marketing aspects? Other industries have gone down that road...

**Heizmann:** It would make life simpler, that's for sure. But that's actually a dead-end. In the case of premium vehicles specifically, the interplay of development and production is essential. We're involved in new vehicle projects from the very first pencil-stroke on, and it's our job to ensure that the designers' and developers' ideas can actually be built. That will only be the case if considerable production expertise is available in-house. In my opinion, contract production only works for niche models. And even then, only for limited production totals. Wherever the critical know-how and core skills are what matter, we prefer to build up the necessary capacity specifically within the company. Our philosophy deliberately goes against the trend.

You mention skills: vehicle development at Audi is now performed to a very high degree on a virtual level. What role do simulations play in production?

**Heizmann:** We've been strongly promoting the idea of the "Digital Factory" for quite a few years; that counts as one of our core skills. We instigate virtual concept studies at a very early phase of the product process. Simulations also play a role in toolmaking: for example, we conduct forming simulations to check whether the panels in question can actually be produced in the manner envisaged and will satisfy our quality requirements. In body manufacturing, the paint shop and assembly, we even simulate entire plants – or represent the flow of materials virtually. In other words, simulation encompasses the entire process chain, long before a physical production plant has taken shape.

A costly affair – so how does it benefit Audi?

**Heizmann:** Ten years ago, the toolmaking shop needed about 15 months to build a volume-production tool for a very complex component such as a side panel frame. Today, thanks to the "Digital Factory", we can achieve that in seven months. We are faster, so we can produce more tools in the same time – and, at the end of the day, that means lower costs.

Apart from simulations, what other innovations can we expect to see in the near future in production?

**Heizmann:** We have quite a few things in the pipeline: for example, we'll be using aluminium to an increasing degree in vehicle manufacturing. In terms of know-how we enjoy quite a lead over our competitors, which we intend to build on. I believe there is considerable potential for multi-material concepts – in other words combinations of steel, aluminium, plastic and other materials. That of course also means that the demands on the production concepts, above all joining techniques, will change. We are making advances in the field of electronics, too: we are working intensively on production and testing concepts and on process reliability. Electronics expertise will increasingly emerge as a key skill. We therefore need highly qualified electronics specialists in production.

Innovations cost money. And Germany is one of the most costly production locations in the world. How do you reconcile the two?

**Heizmann:** We don't see it as a conflict. It makes it all the more important that we exploit innovations in striving to compensate for the higher cost of labour here. We also need to make advances in flexibility and productivity in order to keep Germany competitive as a production location. But we know that low-cost locations, for instance in Eastern Europe, will likewise be improving in this respect. In other words, we need to maintain our efforts to carve out an advantage over other production locations. An advantage in terms of flexibility, productivity and technical innovation. But that advantage is precisely Audi's recipe for success.

| The interview was conducted by Eric Felber.