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> 66 I will show you how easy and fun it is to animate a car with MadCar within 3ds Max 99

André Kutscherauer teaches masterful animation and rigging techniques for the MadCar plug-in. **Page 48**

The workshop

Free demo: MadCar 3 with full scene

Animate your vehicle models in 3ds Max with this fun but powerful plug-in

Plus models, resources and HDRI images for modo

On the Disc

Substance Player
20 high-res textures
See page 112 for more

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The studio
Professional 3D advice, techniques and tutorials

Continued overleaf
There's even more inside...

Turn the page to discover the interviews, reviews, industry advice and more that we've packed into this issue...

Step by step: Car animation with MadCar

Audi R8 2011

❝ While it's one thing to build a car model, it's quite another to get it moving in an animation. Here you can learn how to do just that with 3ds Max plug-in, MadCar ❞

André Kutscherauer is a 3D artist living in Munich, Germany

In this tutorial I will show you how easy and fun it can be to animate a car with the MadCar plug-in which is compatible with 3ds Max. You will discover how to prepare a finished modelled car for animating with MadCar, a host of rigging techniques and, generally, how to master this plug-in.

Along the way, you will find some essential tips on how to realise a whole car animation sequence with different camera views. You will learn how to set up the whole car rig and how to fine-tune the physics settings of the plug-in. Finally, you will just have to attach your game controller and start driving your car as if in a videogame – even with the analogue input – as MadCar can calculate every car movement in real-time! You can watch my finished animation at **www.ak3d.de**.

Start your engines
Get your car models on the move!

01 Modelling The first step is to model a car if you don't have one already. If you'd like to build one from scratch you can follow the two-part muscle car tutorial featured in issues 30 and 31 of **3D Artist**, which are available to buy as back issues from the official Imagine Publishing online store: **www.imagineshop.co.uk**. I have also written a fully illustrated book on how to model an Audi R8 in high quality using the Rhinoceros program; this book is available from my website Ⓐ.

02 Grouping the objects Now you have your finished 3D car model, the second step is to arrange the objects into nine groups that will help for animation. There are four groups for the wheels, four groups for the brake system and one group for the chassis. The four extra groups for the brake system are important because the braking system is attached to the suspension, not to the rotation of the wheels Ⓑ.
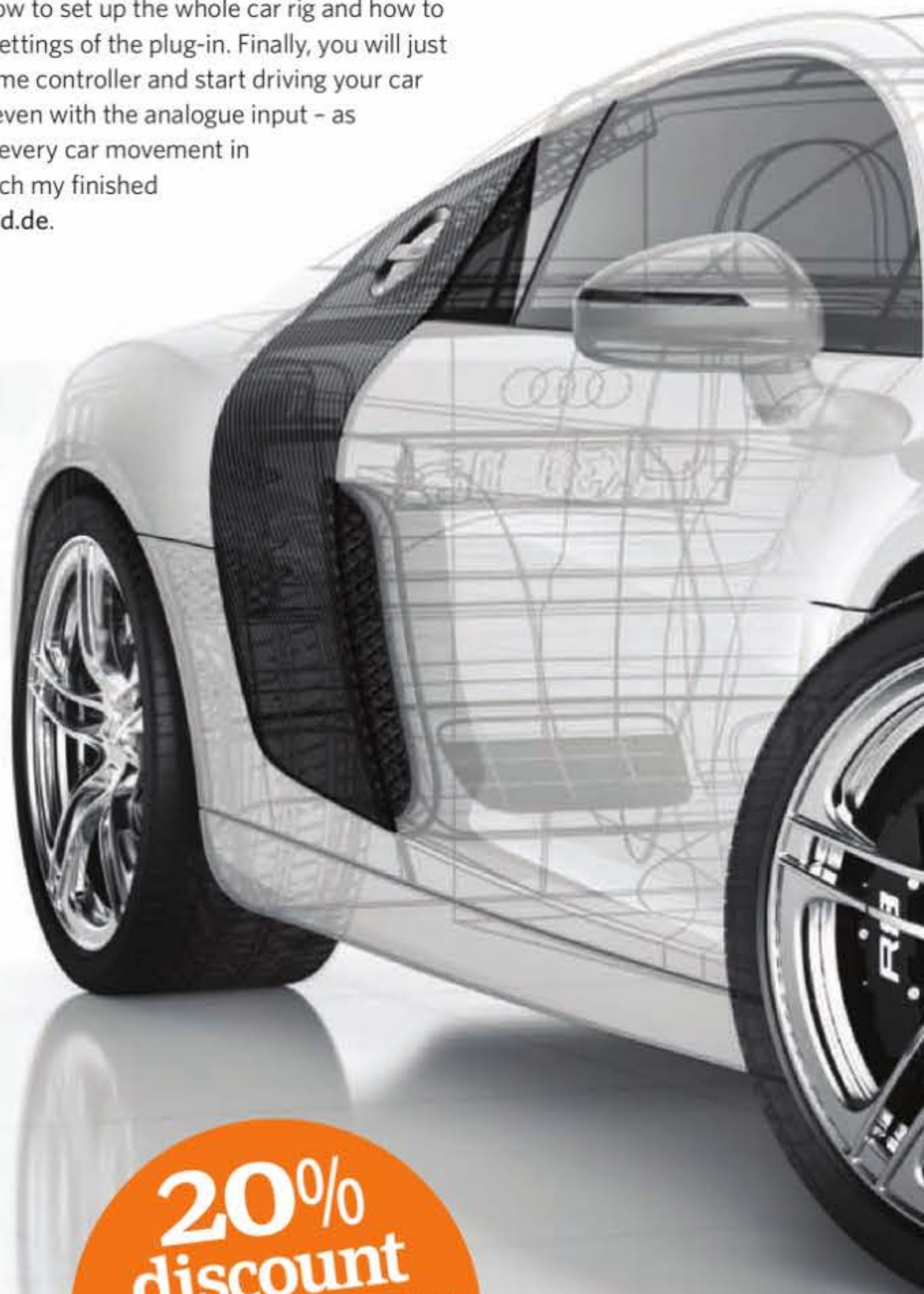
20% discount
Coupon code: 3DArtist
20% discount for MadCar and all R&D Group products on
http://rendering.ru
valid until 17 Oct 2011

Concept

I first came into contact with the MadCar plug-in after finishing my book, *3D Car Modeling with Rhinoceros*. I thought it would be cool to animate the Audi R8 model I'd produced. In my opinion, MadCar was the obvious choice for this task.

3D Car Modeling with Rhinoceros is available as a printed book or a direct PDF download from www.ak3d.de

Software used in this piece

Rhino   3ds Max   MadCar   Vue
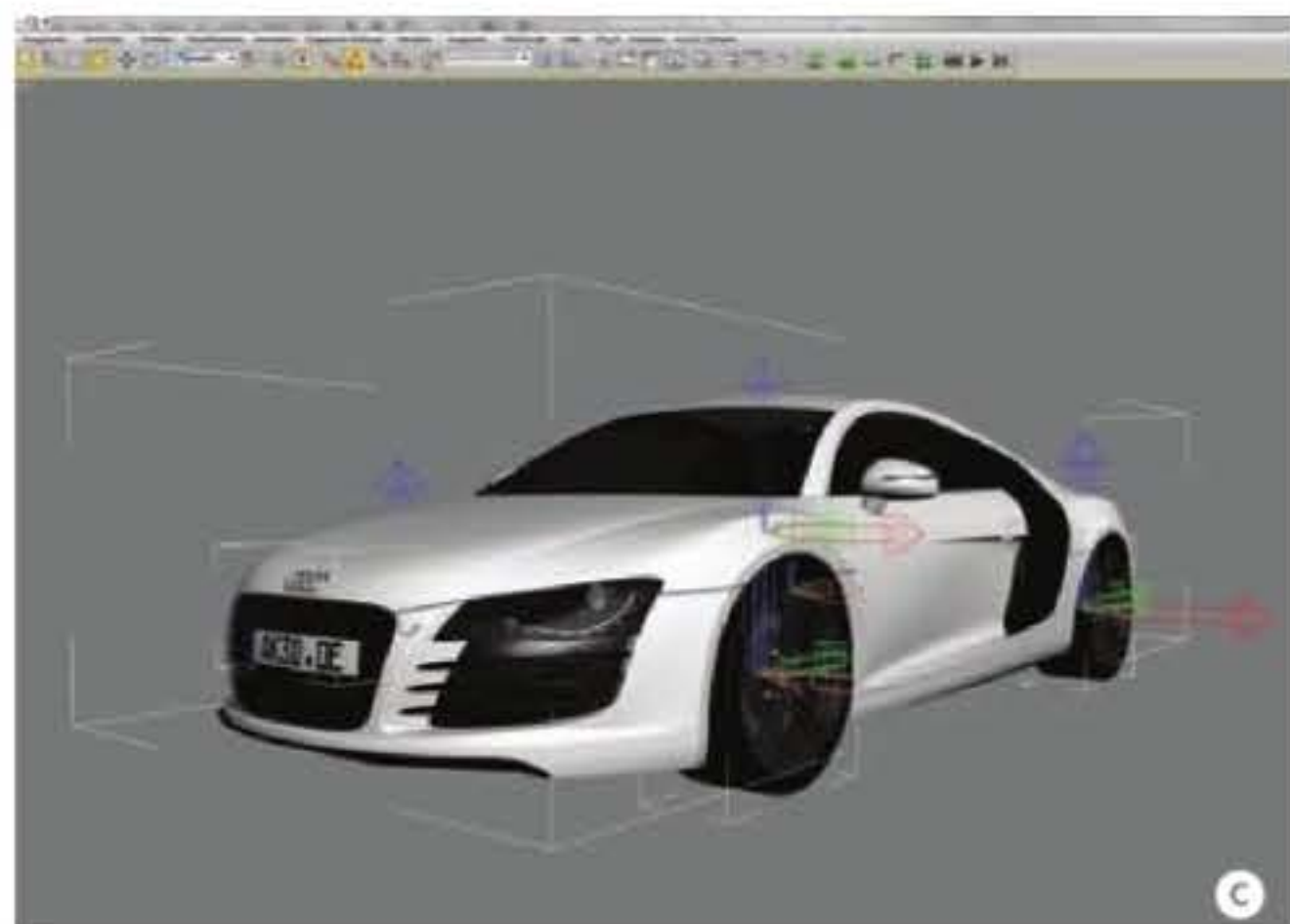
Let's get rigging
Take the time to make animation previews

C

03 Set up the pivot points
It's important to be very precise when setting up the pivot points of these nine groups. The pivot points of the wheels should be exactly in the middle of each wheel; if they're not, the wheel will not rotate smoothly. The pivot points of the chassis and the braking system are not so important but should be fairly central. This step is also very important for the next rigging steps as we will match all helper objects to the pivot points we just made **C**.

D
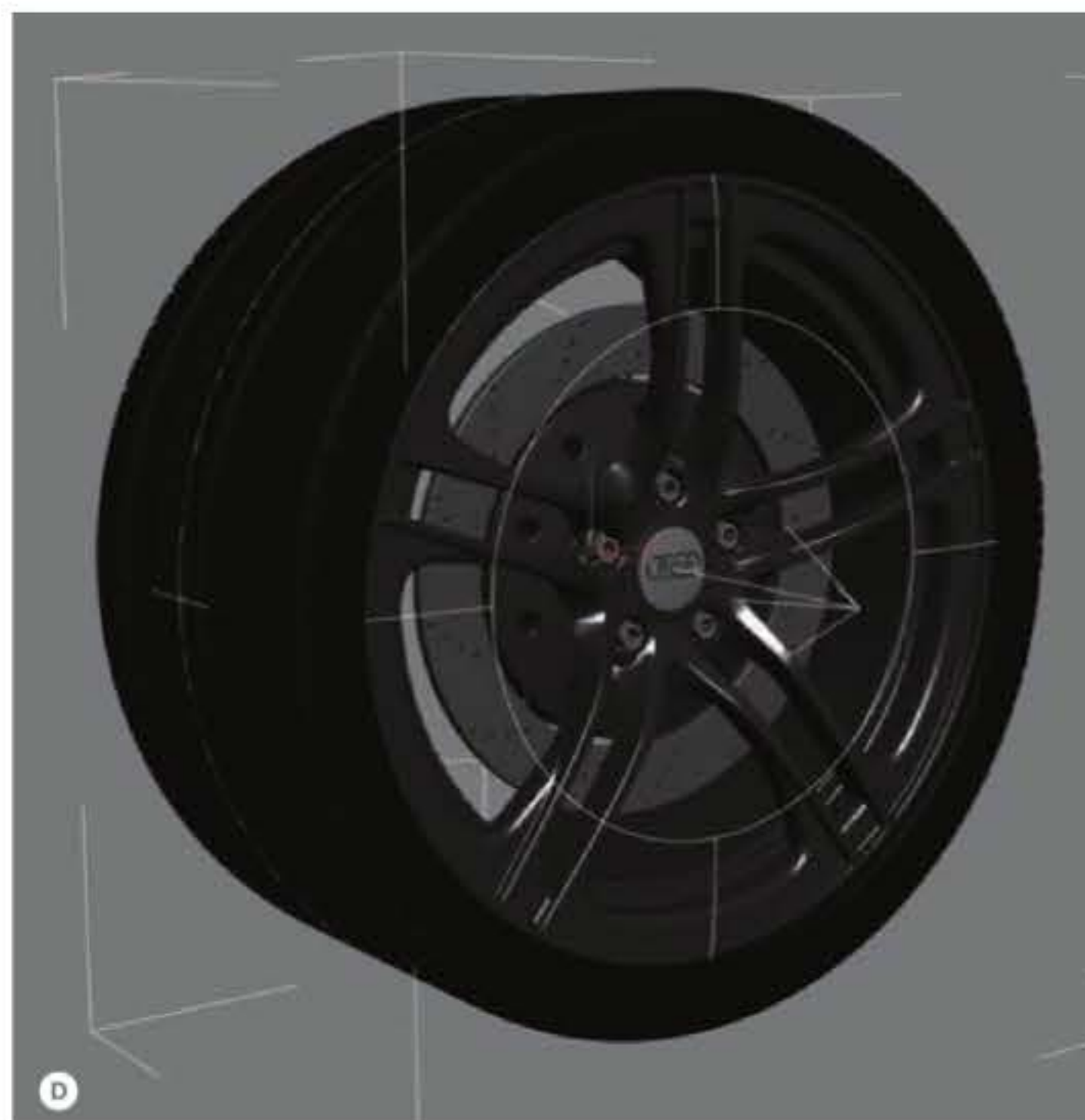
04 Wheel rig
The next step is to create the helper objects in MadCar. The first stage is to isolate one wheel of the car and open the group, so that the bounding of the group box becomes selectable. Then we activate the Object Snap menu and set it to Pivot Point. Now we create a MadCar Wheel helper object, found in the Helper tab in the Create palette. We place this helper object exactly on the pivot position of the wheel group. Then we just have to modify the width and height to match the wheel object. To wrap up, close the wheel group **D**.

E
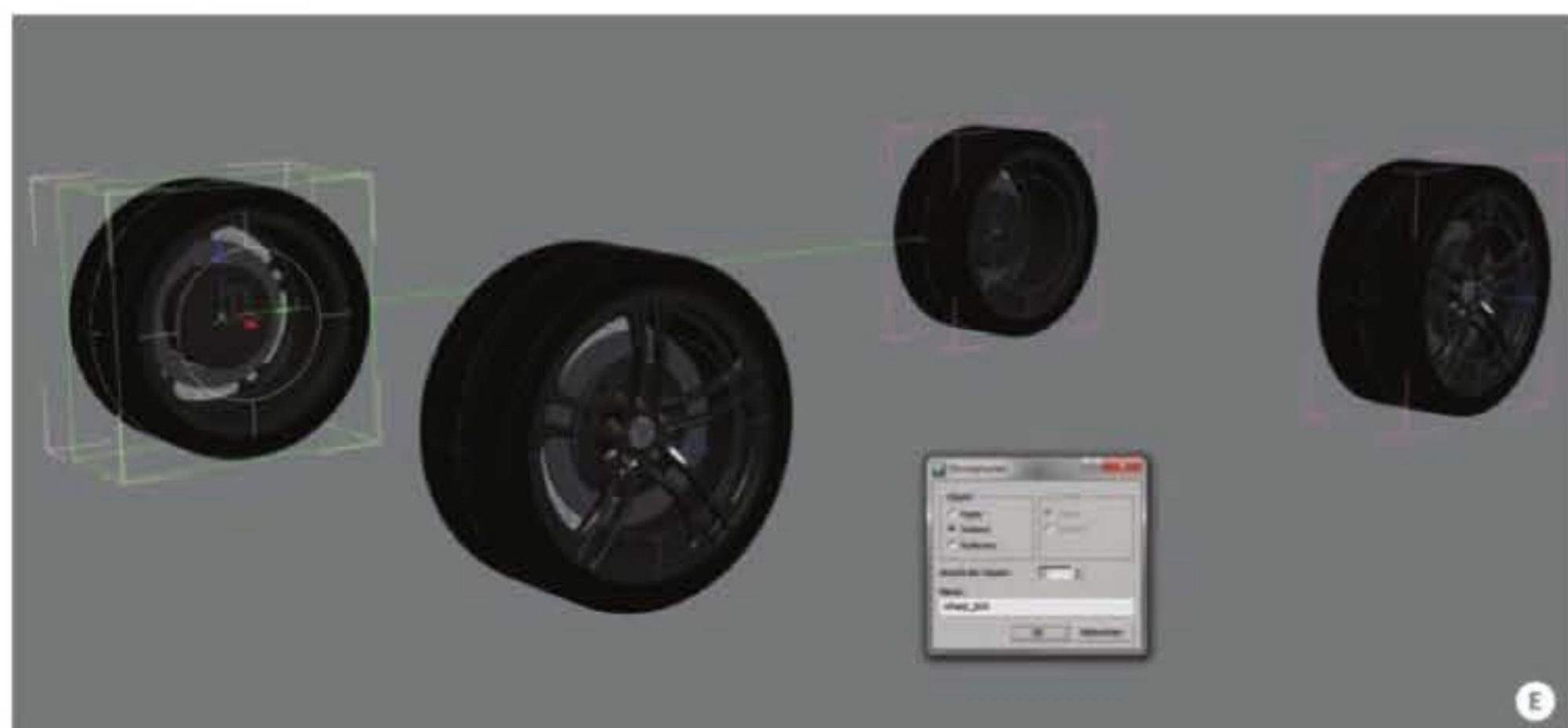
05 Wheel rig 2
We unhide the other wheel groups and then just copy step 4's Wheel helper object onto the other three pivot positions. Next we have to turn the wheels on the right side around 180 degrees, so that the arrow also points to the outside. This is important as the plug-in will calculate the horizontal wheel forces too. Finally we connect all four object groups to the helper object, to tie the motion of the MadCar system to the motion of the real 3D model **E**.

Problems & solutions

During this early stage we need to work very precisely. These are easy steps, but if we don't place the helper objects just so, the whole animation will fall apart later; this can't be repaired afterwards! For example, if we don't align the wheel helpers to the pivot points exactly, all wheels will rotate 'out of axis' later. In the viewport we may not even see this, but after rendering, this laziness will be punished for sure. We should also set up the size of the wheel helpers to the size of the wheels precisely as, otherwise, the car will 'fly' over the street or even sink into the asphalt!

All this can be avoided by checking everything twice. In the viewport we often can't see the sequence with the final frame rate, so we could overlook some frames where those problems occur. A very good way of checking is to constantly render out animation previews in order to spot these problems. You can also check the physical settings using animated viewport sequences. The dynamics depend dramatically on the frame rate.

Artist Showcase

André Kutscherauer
I've been working with 3ds Max for over ten years. In my own artwork I like to keep my pictures as simple and focused as possible. In former times people's homes were full and their heads were 'empty'; today it is the opposite. I think Leonardo da Vinci's quote, "Simplicity is the ultimate sophistication", is very apt in this time of dissipation.

Selfillumination 1 Rhino, 3ds Max, mental ray, Photoshop (2006)
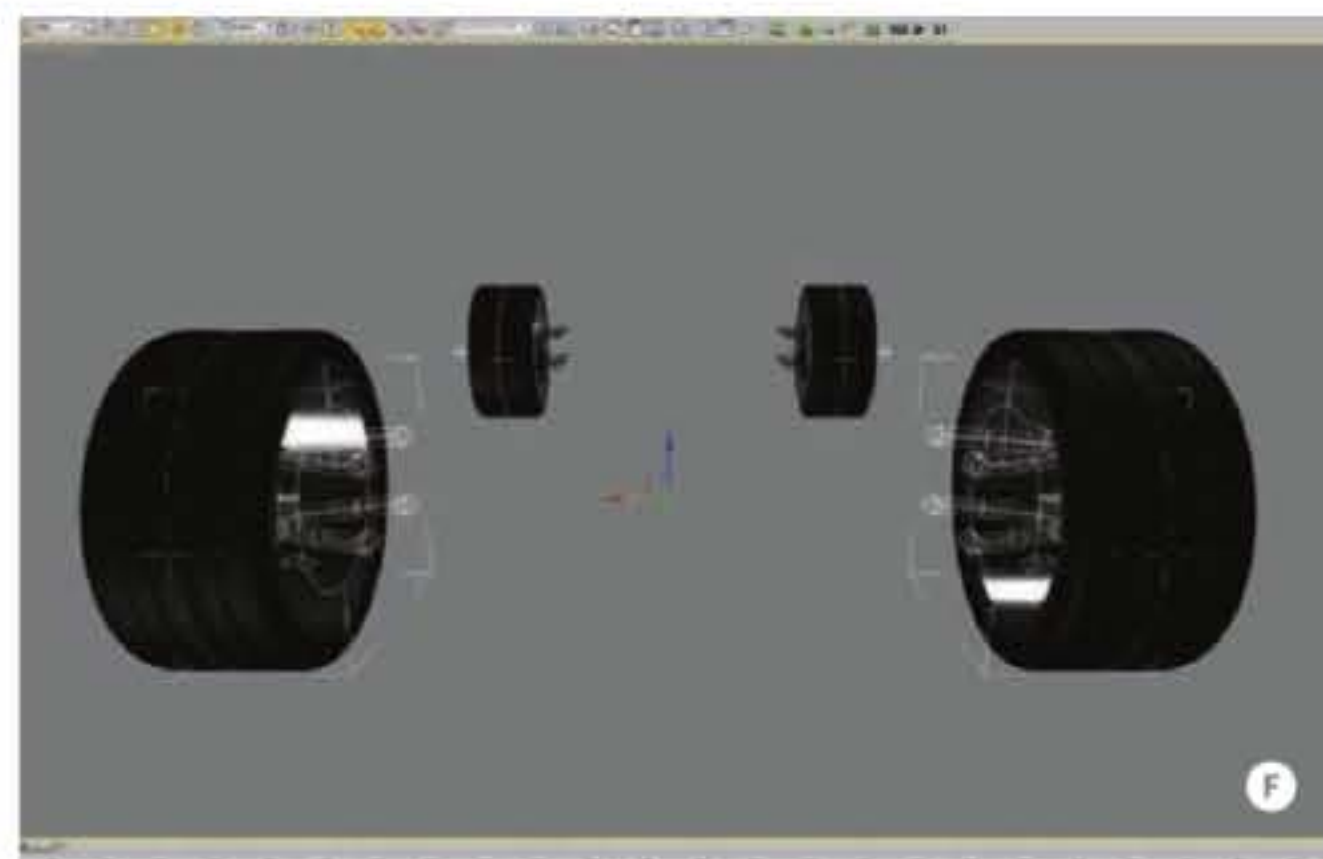A picture about self-fulfilment

Creative world Rhino, 3ds Max, mental ray, Photoshop (2010)
Dedicated to all creatives...

Super suspension

Realistic movement is the key to any car animation

06 Suspension rig Now we will make the suspension helper objects for the front wheels, exactly on the pivot positions of the wheels. The length will depend on your vehicle. In the case of the R8, I chose 25cm. The Top Stop and Bottom Stop values are also dependent on the car. In the settings we enable Wheel Drive and, under Damper, we choose the Sports car preset. That suspension helper object can now be instanced to the left side, snapping it to the pivot point and flipping it 180 degrees **F**
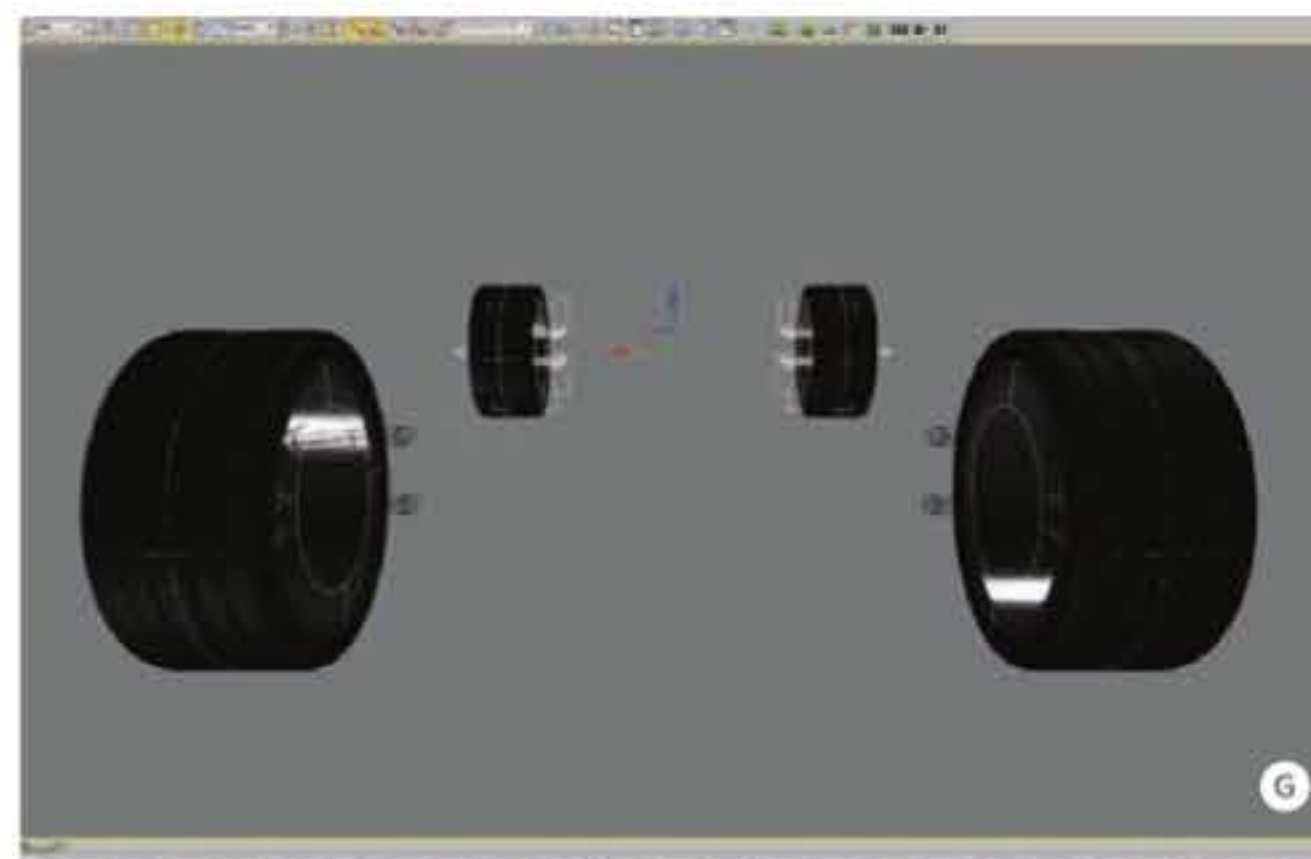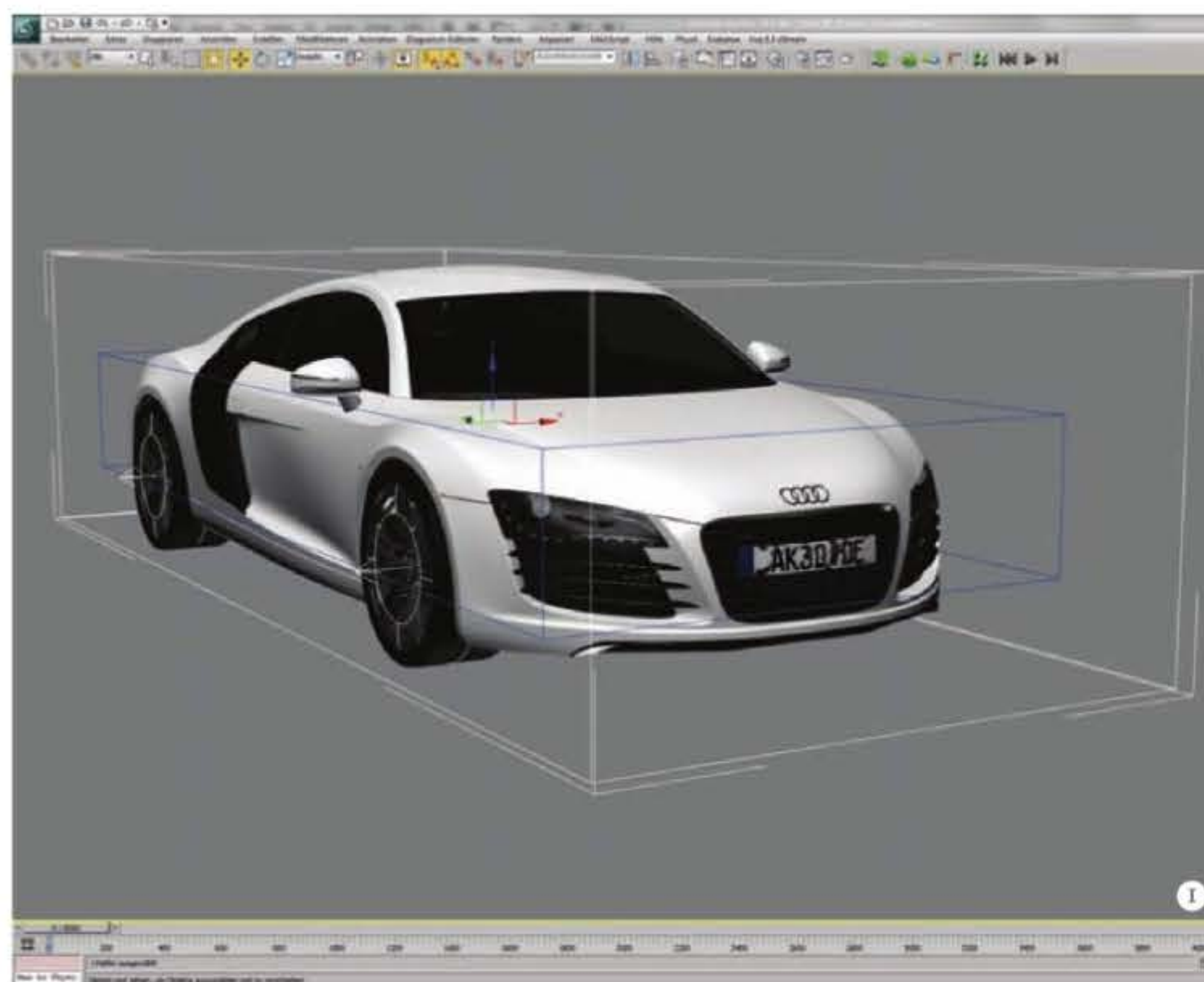
07 Suspension rig 2 We copy one suspension object to the back of the car. It is important to copy it, as we have to apply different settings for the back of the car's suspension. Again, we snap it to the pivot point of one wheel, instance it to the other side and, once more, turn it about 180 degrees. Finally we select Handbrake in the parameters and deselect Wheel Drive for the back wheels of the car. Now we can implement the braking system using these suspension objects **G**

C Setting up the pivots precisely is very important when rigging a car for accurate results later

D Placing the helper objects is easy with the Pivot object snap

E The Pivot object snap is applied to the other three wheel groups

F Setting up the front suspension helper objects

G Setting up the back suspension helper objects

H This shot shows the setting up of the chassis helper object

I The Lock Components command connects all the elements together

08 Chassis Now make a new MadCar chassis helper object. We create it on the pivot position of our 3D model's chassis. For this object it is important to have the same width and depth as the real chassis. The Z position is also crucial, as this is the position of the car's 'centre of gravity'. Because the Audi R8 is a sports car, this point is relatively flat. For any offroad cars, on the other hand, this position should be made much higher. It's vital to get it right as this has a great influence on the car dynamics calculations and, later, how the car handles on the road **H**

Marble brain
Rhino,
3ds Max,
mental ray,
Photoshop
(2010)
One marble for
every thought
and idea...

09 Lock the components It's time to create a MadCar helper object on the pivot position of the chassis. The size is not important this time as it's just an object where most MadCar dynamic settings are reachable. In the options of that object, you might have to correct the Gravity setting to 9.81m/s². Then we can click on Lock Components to connect all structural parts together and to check and finalise our helper setup **I**
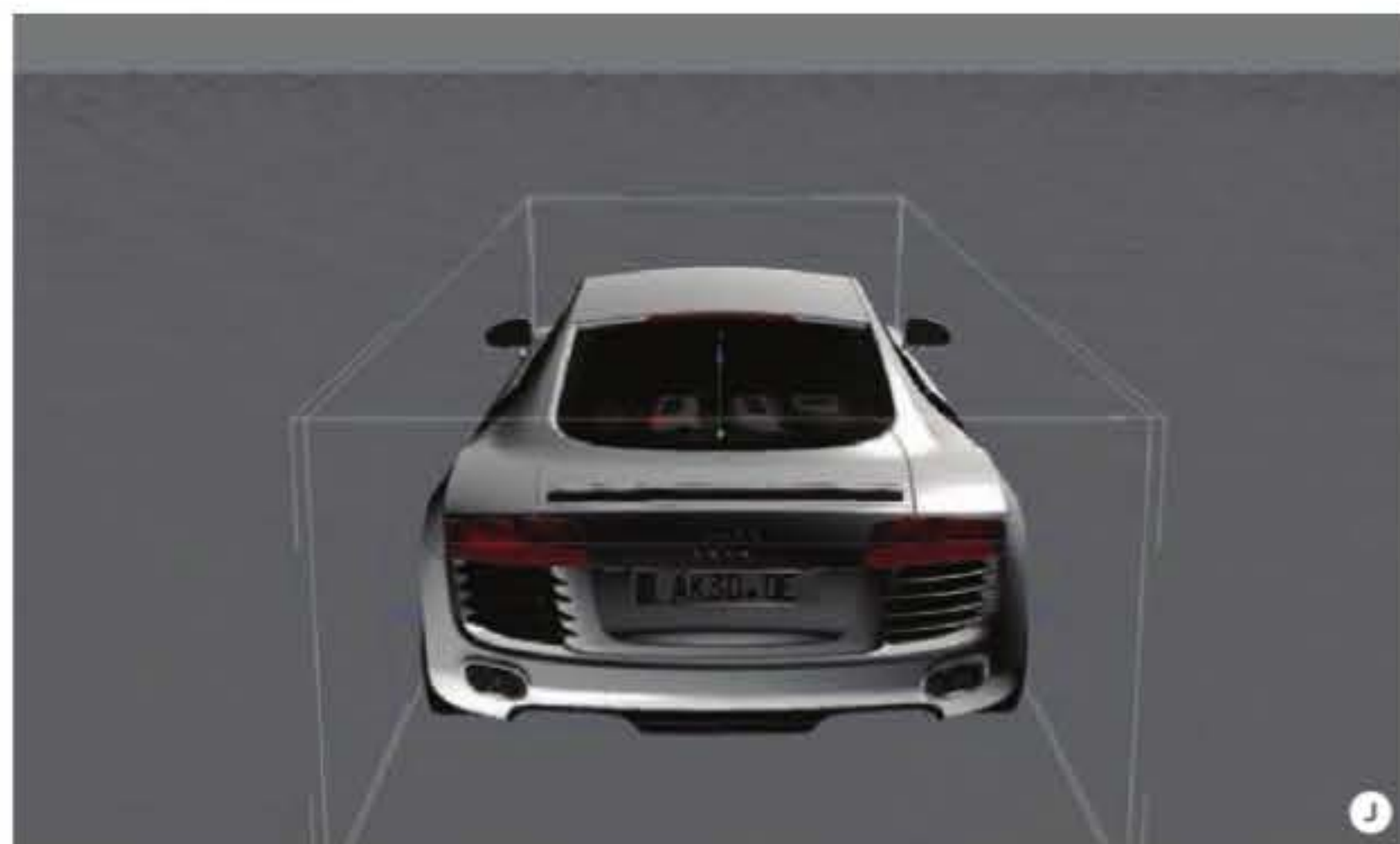
Pimp my MadCar setup
How to keep on track

10 Test drive Now comes the fun part of creating a car animation: the driving! We have to create a plane first, maybe with a little 3D displacement noise added. This surface is placed underneath the car's ground position. Then, in the MadCar settings, we click on Surface and select this plane; a second click on Update Surface should refresh the model. Now we create a camera in the back of the car and connect it to the chassis helper object. Finally we connect our game controller, switch to the Camera viewport and hit Drive **J**.
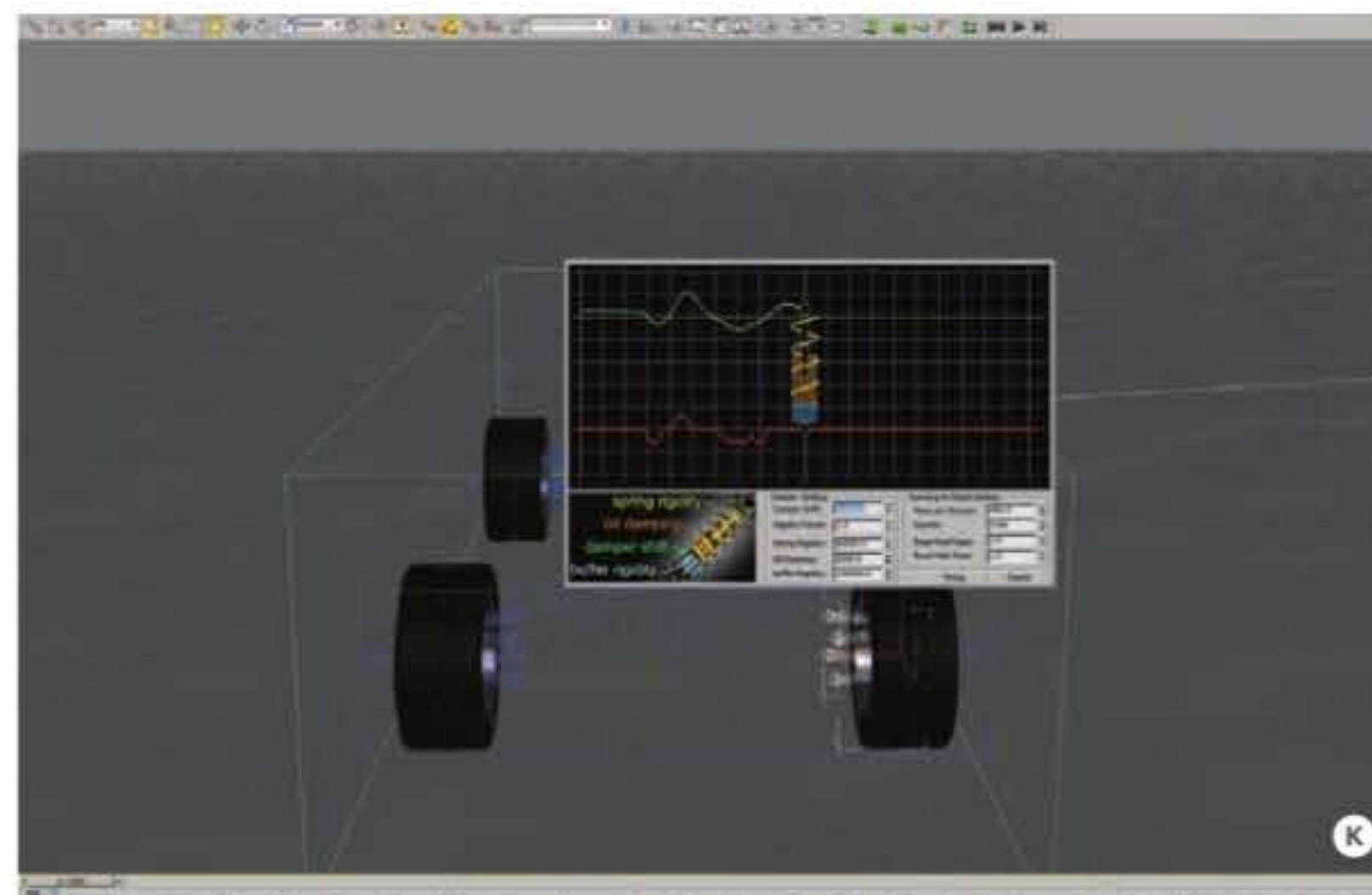
11 Fine-tuning After the first test drive you may come to the conclusion that you have to optimise the physical behaviour of your car. This can easily be done using the Damper settings. It's a really cool feature as it even shows the changes of the settings visually and you can clearly see what happens if you change any of the Damper tools. These settings alter the whole behaviour of the car as each action – eg braking, turning, etc – is affected by the suspension **K**.

12 Test drive 2 After tuning the Damper and other settings, we should do some more test drives to check the behaviour of the car under different conditions, eg on bumpy ground under speed and under slow conditions. Also try out some handbrake turns to check the grip of the wheels. At this point we should clearly have the whole animation in mind. If all the scenes you envisage are possible with the setup, you can take the next step **L**.

13 Building the track At this point you have to choose if you first build a track and then drive on it or if you just drive on a plane and build the track afterwards. For my animation I have opted for the latter, as it was quite difficult to drive a three-minute sequence and keep on the track without any cuts. So, with the wanted manoeuvres in mind, I just drove on a rough plane and created the track at a later stage. After making that trip on the plane, the 'path' was fixed and it was easy to style the track with some interesting features, as discussed in step 14 **M**.

14 Create the landscape Once the track is finalised, we can style the environment the car will be driving through. In my case I modelled a bridge, a seascape and a landscape with more than 80 million trees using e-on's Vue xStream. At the start I wanted some kind of construction depot from which the car drives out. Then I planned to include some nice views over the sea with some sunny effects. Lastly, I wanted to have the car coming to a stop in a parking garage **N**.

J Take a first ride!

K The Damper tools within MadCar are very intuitive

L Putting the car to the test under various conditions

M Building the track

N Styling the course of the car's journey

O Camera setup and rigging in action

P The Camera Manager script by Michael Comet is very helpful for editing the film

Q Rendering with motion blur during post is essential for most car animations

# Changing the world
Build an environment for your car

1 hour render time
Resolution: 1,280 x 720

15 Camera setup To get really good camera movements, we have to think about a camera rig. There are many possibilities in Max to create an action-ready camera rig. In this case, there were some fixed cameras on the track as well as nearly 15 cameras linked to the chassis itself. If the camera movements are too rigid to the chassis, you can try using positional feather constraints. Then the camera is linked as if it is on a flexible rig that makes all movements of the linked objects just seconds later. This lends sequences a more natural and dynamic feel ○
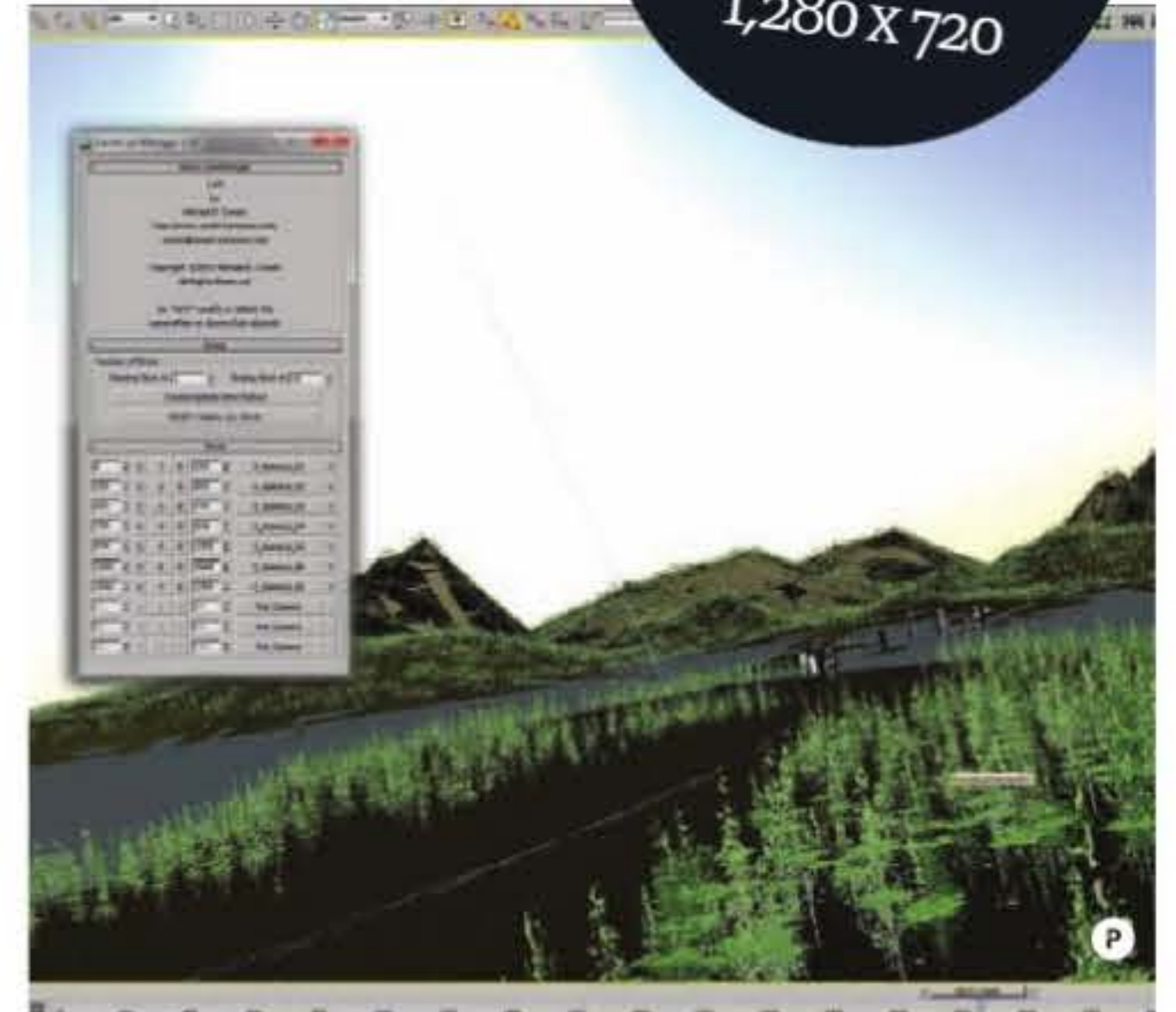
16 A new perspective A difficult part of the 3D animation process is to evaluate whole sequences with cuts before any material is rendered. Normally a real camera team would take a lot of film material, then afterwards, while cutting, that huge amount of material will be spliced together to the three-minute sequence. Often 90 per cent of the filmed material will just be cut out. With rendering, we don't have this luxury. Every frame rendered should be used later on – so cutting and filming have to take place simultaneously. A very handy script for this purpose is Camera Manager by Michael Comet (www.comet-cartoons.com) ℗.

> **Often 90 per cent of the filmed material will just be cut out. With rendering, we don't have this luxury. Every frame rendered should be used later on**

17 Rendering Finally we can render the sequence. For a fast-moving object like a car it's essential to render the scene with motion blur – especially the spinning of the wheels – to end up with a believable scene. A typical video camera has a shutter speed of 1/50fps. We can calculate how often a wheel turns when we film a car driving at around 160km/h; the spokes of the rims will nearly be invisible and we have to calculate a lot of frames just to render one authentic rotation of the wheel ○.