High-speed Flash Capture

ACTION-STOPPING

Photography is all about capturing moments in time. At one extreme, exposures can be seconds, minutes or even hours; at the other, images are caught in tantalisingly brief instants

WORDS TOBIAS BRÄUNING **PICTURES** VARIOUS

Digital capture means you can experiment in the challenging area of high-speed flash photography without having to worry about the cost of film processing. The failure rate is very high and you can shoot hundreds of pictures and only get a handful of 'keepers'.

But get it right and the results are spectacular. David Gittos's portfolio of amazing images over the previous eight pages shows what also can be achieved.

My ambition is to make things visible in events that only last a few milliseconds and are not visible to the naked eye in such detail. There are some well-known subjects like water droplets, breaking bulbs or bursting balloons.

The principle is simple: you need to freeze one short moment of time in a picture and you do this using flash. By its nature, flash photography is about very short exposures. Over the past few issues we have been testing mains flash units, and the duration of a flash burst from some of those units is 1/1000sec or thereabouts. That's quick enough to stop rapid movement in many situations, but here we look at what is possible with even shorter bursts of flash that you can obtain from a hand flashgun.

Many DSLRs have top shutter speeds of 1/4000sec or 1/8000sec but of course, most only synchronise with flash at relatively slow shutter speeds, typically 1/125sec or 1/60sec. Obviously this isn't quick enough for this sort of work and we're talking about effective exposure times of 1/20,000sec or even less. So to get the equivalent of very fast shutter speeds you need to use a speedlight-type flashgun which can produce a burst of light with an extremely short duration. ➥

THIS PAGE Tobias Bräuning has refined his water droplet shooting set-up to such a degree that he can get three droplets colliding for incredible images like this. See his website for more amazing images as well as details of how he does it. It's www.t-braeuning.de.

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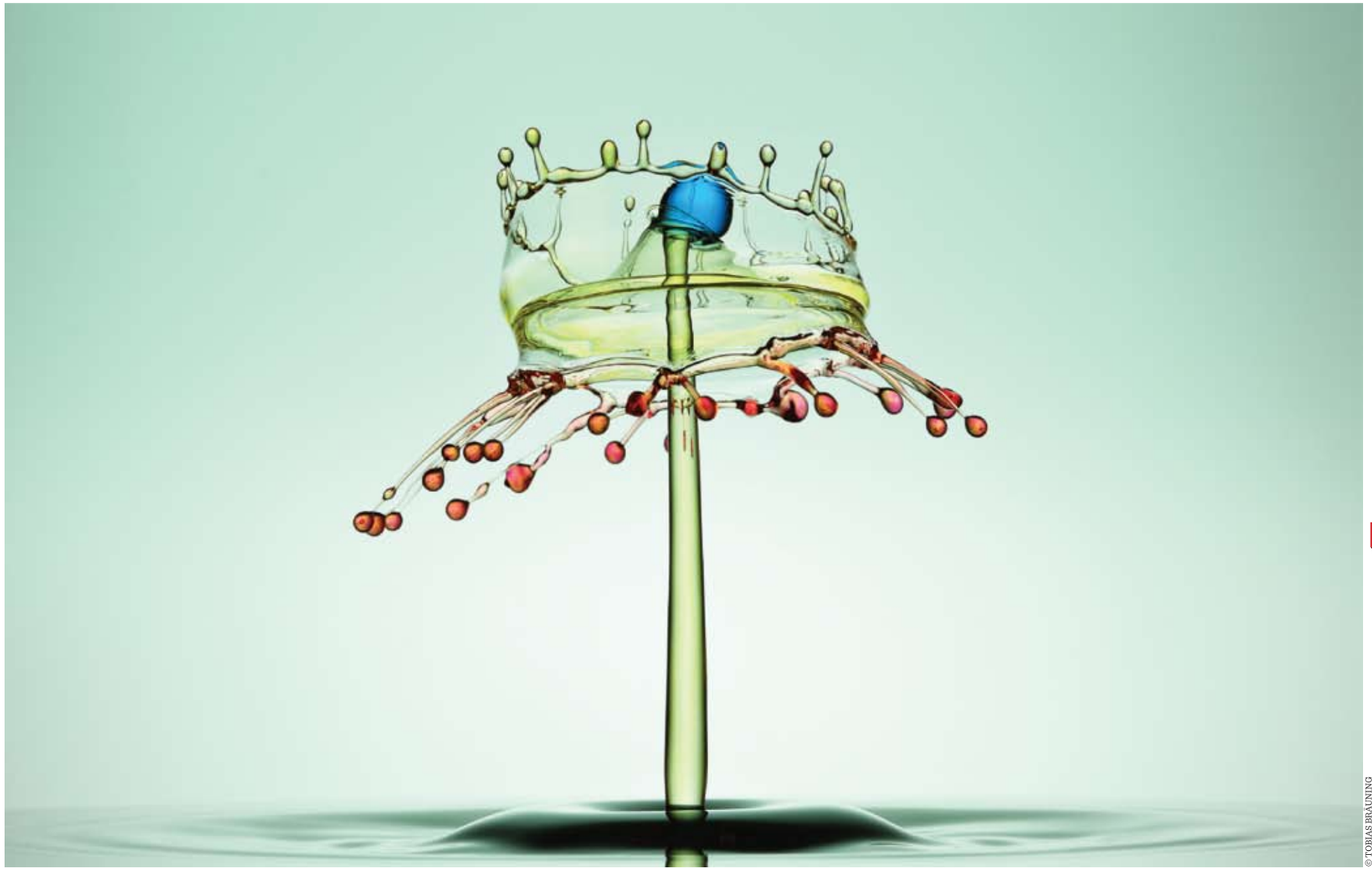

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ABOVE **Photographed using a Canon EOS 40D with EF 100mm f/2.8 USM macro lens with camera settings of 1/10sec at f/18 and ISO 100. Three manual flashguns provided the light.**

The important thing is a suitable flashgun. Advanced automatic metering functions are not essential in this sort of work and mains studio flash units aren't ideal either. See our test in this issue on battery-powered studio flash units for an explanation of how the duration control of mains flash units is different from that of speedlight-type guns. Basically, speedlight-type flashguns give very short flash bursts as output is lowered.

To achieve very short flash durations, you have to reduce the power manually to 1/64 output or less. There are several models available from Canon, Nikon, Nissin and Metz, and some other brands that are able to reduce the power manually so that flash durations are short enough. Search around on the Internet and you'll find some older models available which work well for this purpose – the Vivitar 283 and 285 are good examples. But be careful, some older flashguns use high trigger voltages on the hotshoe and that can damage modern DSLRs. See http://bit.ly/AnXZ6 for details of flashgun trigger voltages.

Once you appreciate that the exposure is only done by a burst of very brief flash you soon realise that any shutter speed longer than the camera's flash sync speed can work. All you need is the camera's shutter completely open at the moment when the flash is fired. In fact one of the easiest ways of starting off in high-speed flash photography is using the B setting. In B, you set up, frame the image and turn off the light before opening the shutter, capture the event with flash and then end the exposure. This works well, but there could be some digital noise caused by the longer exposure times and there is the challenge of working in total darkness.

Working in darkness is not always practical or desirable and you still have to work out how to trigger the flashgun at the right time to record the event.

However, there are several other ways to achieve this. My first high-speed picture was a light bulb that was shot by an air rifle pellet. I took two strips of aluminium foil and placed them on the left side of the bulb close together. When the pellet was fired, it came in from the right side forcing the pieces together to make contact. To connect the contacts to the flashgun, I used a hotshoe adapter which provides a 3.5mm stereo jack on which I could access the outer contact (the metal U of the hotshoe) and also the middle contact (synchronisation) of the hotshoe. By connecting these contacts, the flash fired.

This is one of the easiest ways to start with high-speed photography. The disadvantage with this solution is, that you have no delay between closing the contacts and the flashes firing.

"WORKING IN DARKNESS IS NOT ALWAYS PRACTICAL OR DESIRABLE AND YOU STILL HAVE TO WORK OUT HOW TO TRIGGER THE FLASHGUN AT THE RIGHT TIME"

You could build some electronic delay circuits like those provided by hiviz, or buy a microcontroller and create your own trigger (for example, the photoduino, ➞

© JAMES FARLEY

TECHNIQUE

Bouncing water balls

This is how *Advanced Photographer* reader James Farley set about doing some high-speed flash photography with some aqua gel balls from his garden centre.

"First I made a trough using plasticine to line the edges of a sheet of glass all the way round and to form a solid barrier to contain the water. Care should be taken here. The plasticine requires firm pressure to create a watertight seal and I managed to shatter two pieces of glass from applying too much pressure.

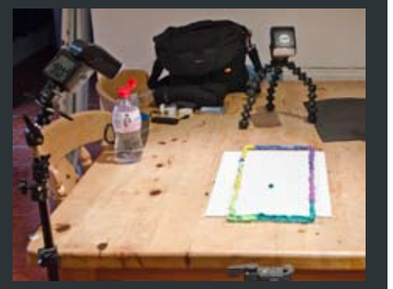
"I placed the glass upon the white panel on a table, and then poured in enough water to cover the working area within the plasticine to a few millimetres depth.

"The camera was fixed on a tripod and positioned square onto the trough.

"I placed a gel ball in the water trough near to the front edge as a reference point, and got composition as low down as possible, keeping the gel ball near centre of frame, and avoiding any plasticine edges from appearing in frame. I would suggest marking the plasticine on either side of the ball to give you a guide on where to drop the next ball later on. I used half a cocktail stick pushed into plasticine on either side to point at the spot.

"The camera was set to manual mode at the fastest flash sync speed and an aperture of f/11. I attached a remote control for hands-free release. Once composition is set up, manually focus on the gel ball.

"Next I set up my flashguns. How you do this is entirely up to you and I would encourage you to play around with positions and power once you have got started, but to begin with, I would always use one flashgun opposite the camera and behind the subject, raised about 20-30cm off the table on a Gorillapod, and pointing down roughly at the point where the reference ball is.



ABOVE **This sort of photography can get messy but if you get it right the results can be marvellous and immensely rewarding.**

"If you are using a second flashgun, I would raise and angle down in the same manner, and start off with it around one of the front corners. Both flashguns should be set at the beginning to 1/16 power and fitted with colour filters if desired, as I did.

"You are now ready to go and the tricky part starts. Grab your trigger in one hand, and remove the ball from the trough with the other, and from a height of about five inches, release it into the trough at the reference point you marked earlier, firing the camera at the point you think it makes impact.

"I would do a couple of these and then go and check the results. It may be that you are firing too early or late, or that you've nailed it on the first attempt. It does takes patience."

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“YOU CAN TRY TO TIME THE SHUTTER AND FLASH FIRING TO COINCIDE WITH THE EVENT YOU ARE TRYING TO PHOTOGRAPH. THIS IS WHERE THE HIGH FAILURE COMES IN”

BELOW **Sailesh Patel suspended an old shampoo bottle with a hole in the base above the glass and controlled drip size with thick thread through the hole. He used a Canon EOS 400D and 100mm lens, 1/200sec at f/11 and ISO 100.**

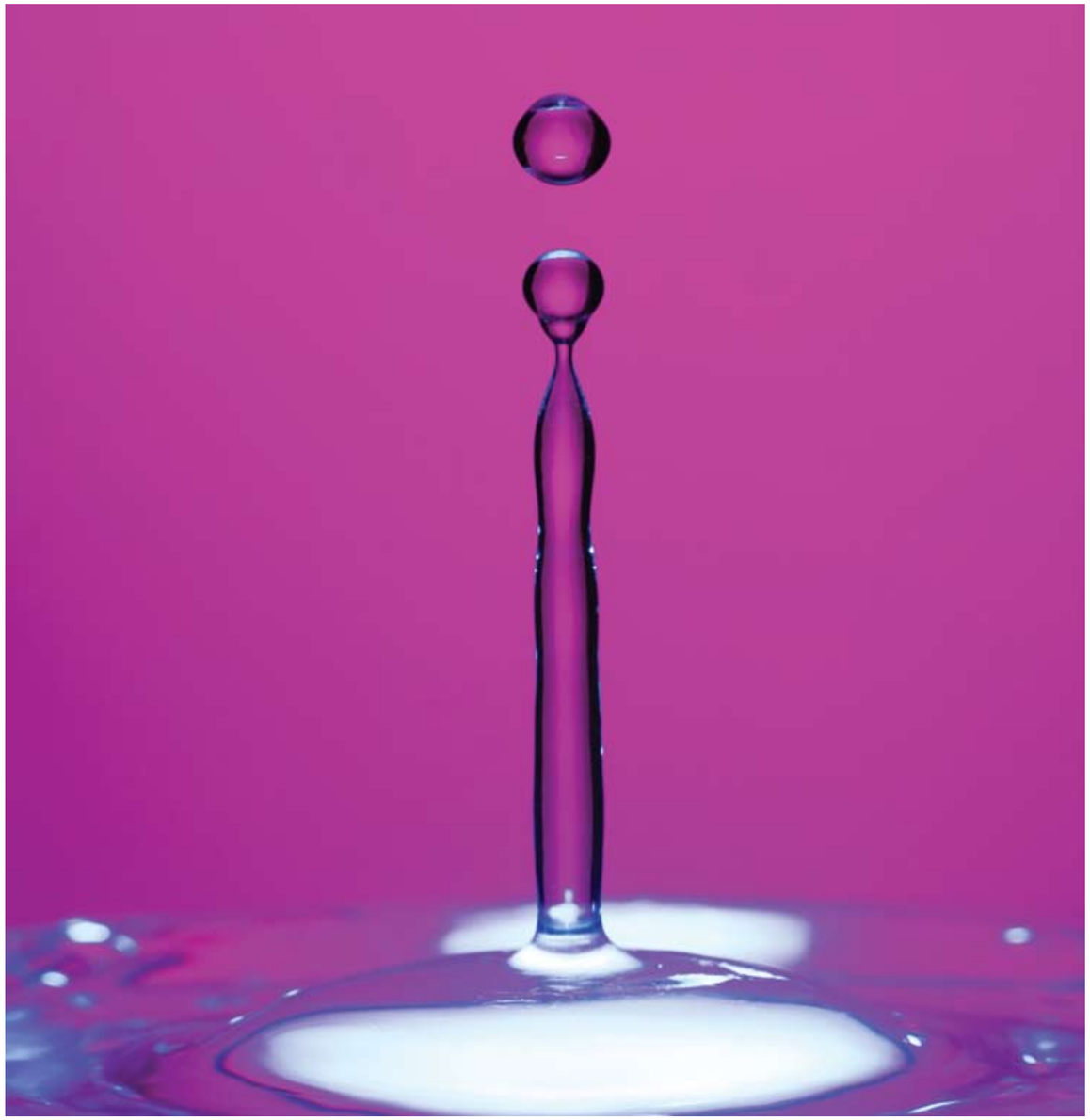
an open source camera controller), or you could buy a ready-to-use device like StopShot, The Time Machine, Camera Axe, Universal Photo Timer or similar. With such devices, you can trigger the flashgun and the camera at exactly the right moment and adjust it in a range of milliseconds.

The manufacturers of these devices usually offer adapters and cables to connect it to your camera and flashgun.

Once you get hooked into high-speed flash photography you can end up making or investing in all sorts of specialist kit. But you can start modestly to get good results before committing time and money.

Working in the B setting we have already mentioned, but you can also just try to time the shutter and flash firing to coincide with the event you are trying to photograph. This is where the high failure rate comes into play and you just have to shoot lots.

For my water drop shots, I use a 100mm Canon macro lens. The distance to the water is sufficient while the field of view is also good. Even the depth-of-field is sufficient. I use apertures from f/16 up to f/20. At longer focal lengths or shorter distances, the depth-of-field gets smaller so



© SAILESH PATEL

© KRIS WILLIAMS

ABOVE **Kris Williams shot his water drop image in the dark, after setting up a system to produce drips at a steady rate and the camera set to make 1sec exposures one after the other.**

the 100mm is an acceptable compromise.

Focusing has to be done manually. An easy solution is to put an object right to the place where the drops come down and to focus on this object manually – a serrated-edge knife works well for this, with the serrations helping focus. A precondition for this is a fixed dropping position as well as a tripod-mounted camera. It is definitely worth spending effort getting a fixed dropping position because depth-of-field is so limited. ISO sensitivity should be kept as low as possible to avoid noise but you need as much depth-of-field as possible from the low power output which in turn allows very brief flash durations.

The first steps in water drop shooting can be taken with an eye dropper or you can use an infusion set with a flow regulator that you can buy on the Internet. You can create a constant drop frequency with it.

For single water drops, the drop rate can be very low. If you want to get drop collisions, it needs to be very fast, about 5-10 drops per second. It’s an easy principle: the first drop falls down into the water and then the water splash comes back upwards. If the next drop falls down onto the upcoming water splash, you get a droplet collision and a circular crown.

For droplets with a nice reflection on the surface, a water tank is needed that is long enough, so that the edges in the front and in the background are not visible when you adjust your camera to look over the water in a low angle. My tank is self-made of high density foam plates which are glued together to make a 440x1000x30mm tank. For shots without reflections, a glass bowl of about 15-20cm diameter is sufficient.

Creating water drops with an infusion set is fine for simple shapes, but you are limited in exact timing of the drops. So I decided to use a home-made device to generate drops with a solenoid valve. I use an Arduino microcontroller board which is able to trigger several valves, the camera and the flashes. The Cognisys StopShot or Mumford’s The Time Machine use a solenoid valve to generate the drops in exactly adjustable distances of time.

This provides the opportunity to create drop-collision of two or more drops, resulting in stunning shapes. There are many parameters which influence the shape – the depth of water, temperature, viscosity, height from which the drops are released, among others. It’s up to you to find new ideas and creative set-ups.

An important parameter is the viscosity of the dripping water. To influence the viscosity and the behaviour of the water, I use guar gum, a thickening agent used in the food industry. This makes the water more viscous and the drops seem to get more elastic, they do not break off as fast as clear water but create bigger shapes. Another great thing is to add some milk, or even drop with pure milk. It creates smooth shapes, and because it’s not transparent, you can create interesting lighting, for example flashguns covered with coloured gels.

This subject area is a challenging one and how you approach it and how you solve the problems is down to your ingenuity and there is no right or wrong. If it works, it’s right, but it’s certain to consume a lot of creative energy once you get hooked, as you surely will. ○

CONTACTS

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