



ALL INSECT PHOTOS BY HUIJ DE WAARD

Microphotography

Microphotography is the extreme form of macrophotography, dedicated to the photography of small objects from life-size to modest enlargements of up to about 20x. Huub de Waard shows you how to capture images from this unseen world.

One of the most popular books that I read during my childhood was 'Eric in the Land of the Insects', written by the Dutch author Godfried Bomans. In this humorous fantasy, nine-year-old Eric enters the landscape painting that hangs on his wall and he discovers a world of man-sized wasps, bees, butterflies and other insects that is stunningly similar to the world of humans.

The book made such an impression on me that I have always wanted to explore such a world full of wondrous creatures myself. Once photography became a part of my life, I purchased the Canon MP-E65mm f2.8 1-5x Macro lens. This combined with a 2x teleconverter gives a maximum magnification of 10x. Suddenly my world was populated with grasshoppers, spiders, snails, flies, dragonflies and butterflies – Eric's world.

The compound eyes of insects, consisting of a large number of ommatidia, have always fascinated me. To uncover as much detail as possible I photograph insects so extremely close that they seem to have a gigantic size. At

Above A portrait of the common yellow dung-fly (*Scathophaga stercoraria*), sometimes called the golden dung fly. EOS 7D, MP-E65mm f2.8 Macro lens, Extender EF 2x, 1/250 second at f6.4, ISO 100, Canon Macro Twin Lite MT-24EX. Magnification: 9.

Magnification A figure showing the magnification for each image is given in the captions. This magnification relates to the size of the subject compared to the size of the image captured by the camera. So if the subject is 1cm long and the image of the subject as captured by the camera is 10cm long, the magnification is 10. This figure gives a guide to the capabilities of the camera set-up. It does not relate to the size of the images printed here.

that scale insects of the same species look very different and each insect seems to have its own character. I am very interested in the behaviour of insects and only take photographs during the day when they are actively foraging.

A jungle out there

The world of insects, spiders and other small forms can be enjoyed on any beautiful day from early spring until late autumn. I can step out of my house on any sunny morning with a cup of coffee and leisurely browse the garden and see where the action is.

Or I can choose my spot and watch and wait. With a little patience, insects and spiders will show themselves and sometimes seem to pose for the camera.

Watching the world of gardens in this way quickly reveals that it is truly 'a jungle out there' – a jungle of small predators and prey striving for survival.

Microphotography can uncover amazing details of the mysterious world of insects. And this amazing world of insects is right outside the door of virtually every home.



Top Frontal portrait of the robber fly. EOS 7D, MP-E65mm f2.8 Macro lens, 1/250 second at f13, ISO 100, Macro Twin Lite MT-24EX. Magnification: 5.



Above A juvenile grasshopper. EOS 7D, MP-E65mm f2.8 Macro lens, Extender EF 2x, 1/250 second at f11, ISO 100, Macro Twin Lite MT-24EX. Magnification: 6.



Top Small wasp on a dandelion. EOS 7D, MP-E65mm f2.8 Macro lens, 1/250 second at f8, ISO 100, Macro Twin Lite MT-24EX. Magnification: 5.



Above Small crab spider. EOS 7D, MP-E65mm f2.8 Macro lens, Extender EF 2x, 1/250 second at f8, ISO 100, Macro Twin Lite MT-24EX. Magnification: 8.

Avoid getting eaten

Insects generally have two things in mind – to get on with the task at hand and avoid getting eaten. The task at hand might be finding food, mating, or just basking in the sunshine. This means that insects are somewhat predictable.

Bees, butterflies and similar insects, for example, might be just bumbling about from flower to flower. One of the first things you'll notice is that some insects are extremely skittish, like butterflies, damselflies, and dragonflies, while others aren't bothered by your presence at all.

You'll see that some insects are constantly moving about, such as ants and bees. Others, such as spiders and assassin bugs, prefer to sit still for extended periods. And others still, like leafhoppers and plant hoppers, don't seem to mind being photographed, but will shyly turn their back on you, forcing you to change position constantly.

The point is that you should invest some time getting to know the common behaviour of your tiny subjects and how they sense their environment before firing the first frame.

MP-E 65mm f2.8 1-5x Macro

Unlike other EF and EF-S macro lenses, the MP-E65mm offers no infinity focusing. It only operates in a range of magnifications from 1x to 5x. Not surprisingly, focusing is manual rather than automatic (which is why it does not carry the EF (electronic focusing) designation).

Autoexposure in daylight and with the Macro Twin Lite MT-24EX should be accurate, but check your results and apply compensation if required.



Focusing distance	Working distance	Magnification	Picture field
0.243 metres	101mm	1x	36 x 24mm
0.238 metres	63mm	2x	18 x 12mm
0.253 metres	50mm	3x	12 x 8mm
0.285 metres	44mm	4x	9 x 6mm
0.313 metres	41mm	5x	7.2 x 4.8mm

Focusing distance is from the subject to the digital sensor. Working distance is from the subject to the front of the lens.

Getting to know your subject

Most insects are seasonal creatures and the larger ones are most plentiful during spring and summer. If you begin looking in late autumn or at the end of winter you will mainly find insects that measure only a few millimetres in size. Larger than life-size magnification is required to reveal the structure of the compound eyes of such small insects.

The time of day you choose to go out hunting for insects can have a dramatic effect on both the number of insects you encounter and the quality of their demeanour when you photograph them. I only take micros during the day time when the insects are actively foraging and moving from feeding place to feeding place. Try to be as prepared as possible – during these daylight hours they are only stopping for very short periods of time.

Insects and spiders are literally everywhere and in immensely vast numbers. Walk through any flower garden and your first attention is probably drawn to the beautiful blossoms. But on closer inspection, you're also likely to see and be amazed by a myriad of insects that are enjoying the flowers right along with you – bees, hoverflies, and any number of unrecognised insects flying around or walking upon the petals and blossoms. All you have to do is to know what type of insect you're looking for and a little

bit about that insect's behaviour and you'll know where to start.

Damselflies, dragonflies, and mayflies like water, so if you want to find them, start at a pond or lake. Butterflies and bees like blossoms and blooms, so if you want to find them, go where the flowers are. Grasshoppers like to hang out in ground cover like grasses. In order to see these small subjects you have to become quite focused with your vision.

Approaching Insects

Although most insects do not have orifices in their body for picking up sound vibrations, many use parts of their body, such as their wings, antennae, or special hairs, like TV antennae to detect vibrations in the environment or in the air. Any errant movement on your part could cause you to lose a shot, so be sure to tread carefully when approaching your subjects. Your job is to make yourself nonthreatening. The first thing you want to do is to move very slowly. Look before you move, look at where you place your feet, look at where your equipment is and most of all plan where you are going to put the front of your lens. Many potentially good shots have been ruined by the front of a lens bumping a branch or leaf where an insect was resting, causing it to flee.

Different view

Most insects have a view of the world that is very different from ours. Insects such as the housefly, the hornet, the butterfly and the beetle have compound eyes. These are made up of many separate units called ommatidia. Each ommatidium samples a small part of the visual field. Having multiple ommatidia allows the animal easily to detect motion. Some, like the dragonfly, have as many as thirty thousand units per eye, each with its own lens. With a compound eye the insect sees a mosaic image. Because the lenses in the insect's eyes have a fixed focus and can't be adjusted for distance, insects see shapes poorly.

Flicker effect

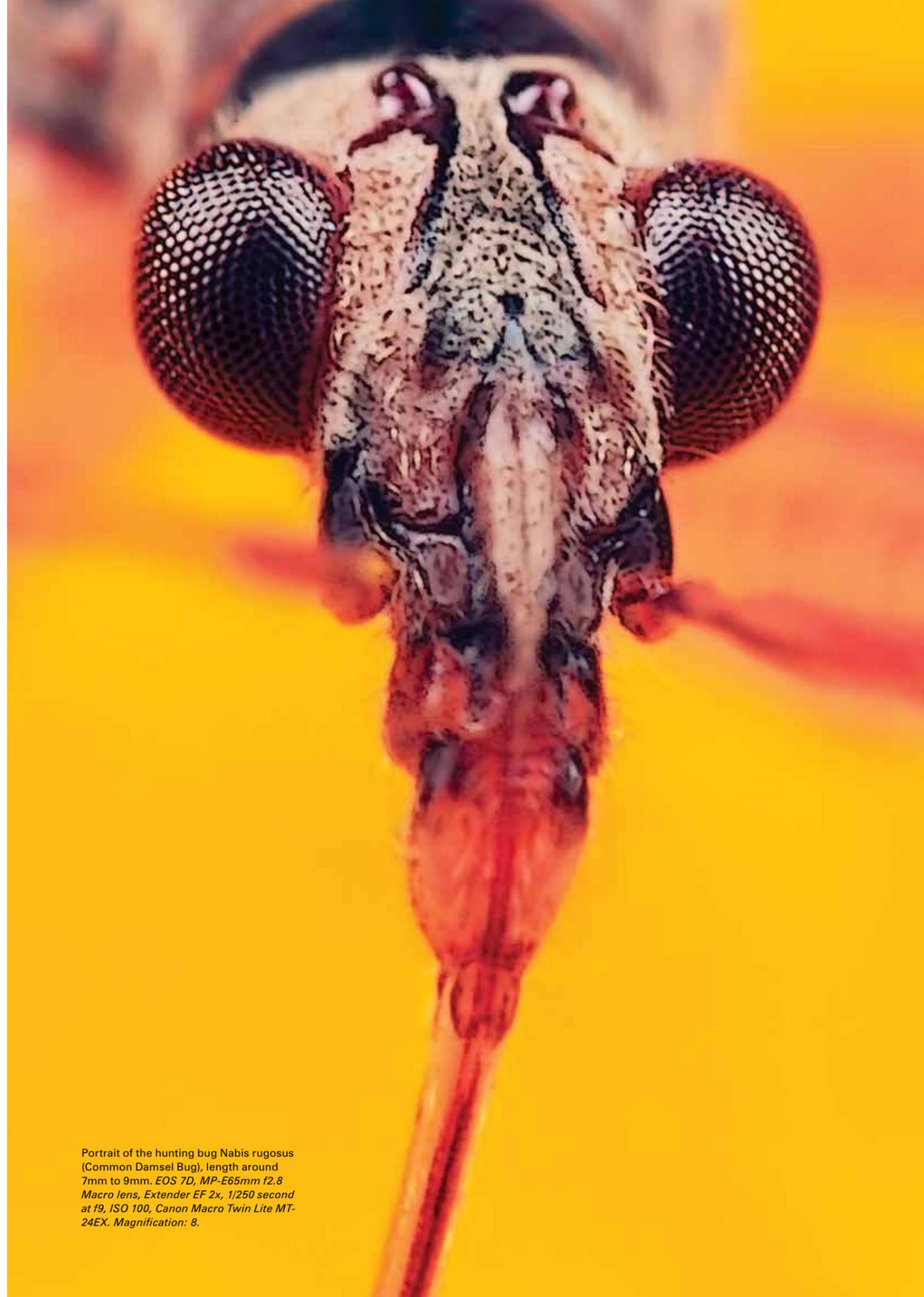
As an object moves across the visual field, ommatidia are progressively turned on and off. Because of the resulting 'flicker effect', insects respond far better to moving objects than stationary ones. Honeybees, for example, will visit wind-blown flowers more readily than still ones. Houseflies and dragonflies have eyes that cover most of their head. This gives them almost 360 degree vision, enabling them to see predators coming from any direction. Most insects can see some colour. While our eyes see a full spectrum of wave lengths from red to violet, many insects see a limited range. The colours they detect are the ones most useful for finding food and shelter.

Escape reflex

It is known that insects, especially flying insects, will try to escape from a predator by a simple escape reflex based on the direction and the velocity of a moving shadow or object. If a critical velocity is exceeded, the insect will try to fly away from the direction of the threat. Slow moving objects or shadows often do not trigger this reflex. The lesson learned is that the best way to approach an insect is to move slowly and gently. Most of all, avoid casting your shadow on the insect.



Above Portrait of an ant with a length of around 5mm. EOS 7D, MP-E65mm f2.8 Macro lens, Extender EF 2x, 1/250 second at f6.4, ISO 100, Canon Macro Twin Lite MT-24EX. Magnification: 8.



Portrait of the hunting bug *Nabis rugosus* (Common Damsel Bug), length around 7mm to 9mm. EOS 7D, MP-E65mm f2.8 Macro lens, Extender EF 2x, 1/250 second at f9, ISO 100, Canon Macro Twin Lite MT-24EX. Magnification: 8.

Lenses and accessories for microphotography



Left EF 50mm f2.5 Macro with Life-size Converter

Below EF-S 60mm f2.8 Macro USM



Right EF 100mm f2.8L Macro IS USM

Far right EF 180mm f3.5L Macro USM

Below MP-E65mm f2.8 Macro



Most macro lenses are able to capture a life-size (1:1) image of a subject on the camera's sensor. Strictly speaking, a lens is categorized as a macro lens only if it can achieve this 1:1 magnification.

The EF 50mm f2.5 Macro only offers half life-size, but provides life-size images when the Life-size Converter is added. The EF-60mm, EF 100mm and EF 180mm macro lenses all go from infinity to life-size in a continuous turn of

the focusing ring. All can be used for microphotography when coupled with a close-up lens, extension tube or Extender (see below).

The odd lens out above is the MP-E65mm (see page 67). This starts at life-size magnification and extends to 5x magnification. There is no infinity focusing – and no autofocus. Adding an extension tube or Extender gives even greater magnifications.

Magnification

Magnification describes the relationship between the actual size of the subject and the size of its image on the sensor of the camera. Photographing a 3cm (1.18 inch) long blue-tailed damselfly so that its image size is 1cm (0.39 inch) on the sensor means that the magnification is one-third (1:3) life-size. Dividing the size of the subject's image on the sensor by the actual size determines the magnification. At 1:1 life-size, the size of the subject on the sensor is as big as it is in real life. Microphotography is restricted to magnifications in the order of 1:10 to 1:1 life-size. When this magnification is reached, shooting from life-size to magnifications of up to 20x (20:1) is called microphotography. Greater enlargements are possible with a microscope – from about 20x with a standard microscope to over 1500x with a research microscope. A camera may take the place of the eyepiece of a microscope in a basic outfit. This is photomicrography.



Close-up lens

Placing an auxiliary close-up lens in front of a macro lens will increase the magnification. A Canon close-up lens 250D (+4 dioptres) gives a magnification of about 1.4x when fitted to the EF 100mm f2.8 Macro lens. A Canon close-up lens 500D (+2 dioptres) gives a magnification of about 1.2x with the same macro lens. There is no light loss when using close-up lenses.



Canon Extender

By adding an Extender (Canon's name for a teleconverter), an even greater magnification can be achieved. Fitting a 2x teleconverter increases the magnification by a factor of 2. There is two stops loss of light. In the macro lens range Canon Extenders are only compatible with the MP-E65mm and EF 180mm lenses.



Extension tubes

The minimum focusing distance of a lens is the closest distance your lens will allow you to get to your subject while still maintaining sharp focus. One way to decrease the minimum focusing distance is to extend the distance between the lens and the sensor by inserting an extension tube. The tube does not contain optical elements. The further the lens is from the sensor, the closer the minimum focusing distance and the greater the magnification. There is a loss of light which can be compensated by an increase in the exposure. Extension tubes can be used with many lenses. Canon offers two extension tubes – EF12 II and EF25 II. The number indicates the length of the tube in millimetres. Autoexposure is retained. Focusing is best done by switching the lens to 'MF' (manual focus) and moving the camera back and forth (see opposite page).



Macro Twin Lite MT-24EX

The problem with shooting at extreme magnifications is camera shake. The slightest movement of the camera will register as blur on the image. You could fit the camera to a sturdy tripod, but this restricts your movement as the subject moves around. The answer is to shoot with electronic flash. The duration of the flash is short enough to 'freeze' camera shake at these magnifications – as the photographs on these pages demonstrate. If you want a versatile flash unit for close-up, macro and micro photography, take a look at the Macro Ring Lite MT-24EX. It features two mini

flash heads which can be individually rotated around the ring on which they are mounted. This means you can have one flash head above the subject and the other to the side – or any other positions which suit the subject. You also have the choice of firing one or both heads and using them off the mounting ring. The guide number is 22 (ISO 100, metres), which might sound low, but remember that the flash heads will be very close to your subject. Focus-assist and modelling flash are provided, along with many other features. With an rrp over £1000 (street price around £750) the MT-24EX is not cheap, but does the job very well.

Composition

Composition is more difficult for microphotography than for other types of nature photography.

Your subject might be an insect or a spider sitting in a difficult-to-reach place. Add the fact that you need to approach very carefully so as not to disturb your subject and you have a bit of a tricky situation.

There are no golden rules to help you solve this one. Play around with composition until you get something that works. In microphotography, you want to simplify your image as much as you possibly can. Fill as much of your frame as possible with the subject. Have your focus as sharp as possible and don't be afraid to experiment with different angles to find the one with the most aesthetic appeal.

Photos at high magnification have a correspondingly shallow depth-of-field, so precise control over where you focus is critical. This requires not only artistic decisions about what part of the subject should be tack sharp, but also technical decisions about how to make the most of this sharpness.

Easy-to-see focus

Fortunately, the location of the sharpest focus appears much more pronounced in the viewfinder when the subject is at high magnification. However, just because it's easy to see doesn't necessarily mean that it's also easy to position.

Even small errors in a camera's autofocus can be disastrous for an image. This should only be used as a rough guide – precision adjustments should almost always be done using manual focus (turn the switch on the side of the lens to 'MF'). Move the camera back and forth and fire the shutter as the subject comes into focus.

It's an almost universal rule that the subject's eye(s) should be the location of sharpest focus and should have a well-chosen position within your composition. For maximum sharpness throughout, adjust the angle of your camera so that the plane of sharpest focus aligns with the head/plane of your subject. If you're off by a fraction of a degree, the complete subject can disappear from view.

Checking the background

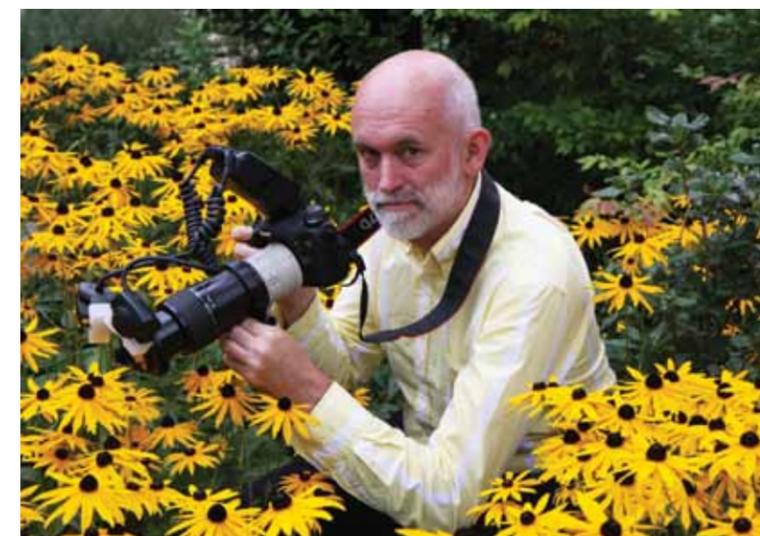
In microphotography, the background is often so out-of-focus that it appears as a solid or smoothly varying patch of colour.

It's important to choose a background which complements the colour and tone of your foreground subject. Fortunately, you can often pick a different background by simply shifting the camera's vantage point.

You should also take care to avoid including distracting out-of-focus highlights or other objects behind the subject.

Your final microphotography image should display fascinating details which are unfamiliar to us in our everyday lives.

Focusing



Above Huub de Waard in his garden 'jungle'. He is using an EOS 7D with the MP-E65mm Macro lens, an Extender EF 2x and a Macro Twin Lite MT-24EX. The electronic flash means that he can hold the set-up by hand and not worry about the effects of camera shake.

Working with large magnifications means that the subject is only a few centimetres in front of the lens. During the day insects move from feeding place to feeding place or are hunting. They stop only for very short periods of time at a specific place to forage, which means that there is no time to set up a tripod. You need to handhold the camera to obtain the photos.

Light is lost when using macro lenses, extension tubes and teleconverters. As magnification increases, depth-of-field decreases rapidly. Due to loss of light and depth-of-field considerations, it is advisable to use a ring flash or twin flash when shooting micros. It will allow you to shoot at a reasonable speed, yet enable you to use a small aperture for sufficient depth-of-field and a fast shutter speed (usually your camera's flash synchronisation speed of 1/200 or 1/250 second) to capture moving insects. Magnifying the image also magnifies any movement of the camera and the subject, so it becomes a challenge to make super sharp images.

Focus with camera movement

Because I am handholding a relatively heavy and bulky set-up, it is not possible to focus using the lens focusing ring, which also determines the magnification. Rather, I pre-set the focusing ring based on how much magnification I want. Once the focus is set, I physically move the lens, mounted on the camera body, back and forth until the facets in the compound eye(s) of my subject are in perfect focus in the viewfinder. This is the tricky part, obviously, as a fraction of a millimetre can significantly affect the focus. For instance, at five times life-size the depth-of-field of the MP-E 65mm lens at f16 is 0.269mm. For higher magnifications, the situation is even worse. In order to stabilize the whole setup, I'll rest my elbow on my knee or both elbows on the ground. As soon as I see perfect focus being achieved, I'll press the shutter button to take a photo.

If you're on the path to taking micro photos, be patient and enjoy the challenge of capturing these images. It opens the doors to an entirely new world of photography.

About Huub de Waard

Huib de Waard is a Dutch wildlife photographer who specializes in insect macro and microphotography. He photographs very small invertebrates so close that they are transformed into large subjects.

Through his images he aims to highlight the different characteristics of a variety of species – and their individual charm.

He does not apply focus stacking and all of his pictures are single images. His work can be found at www.huubdewaardmacros.com