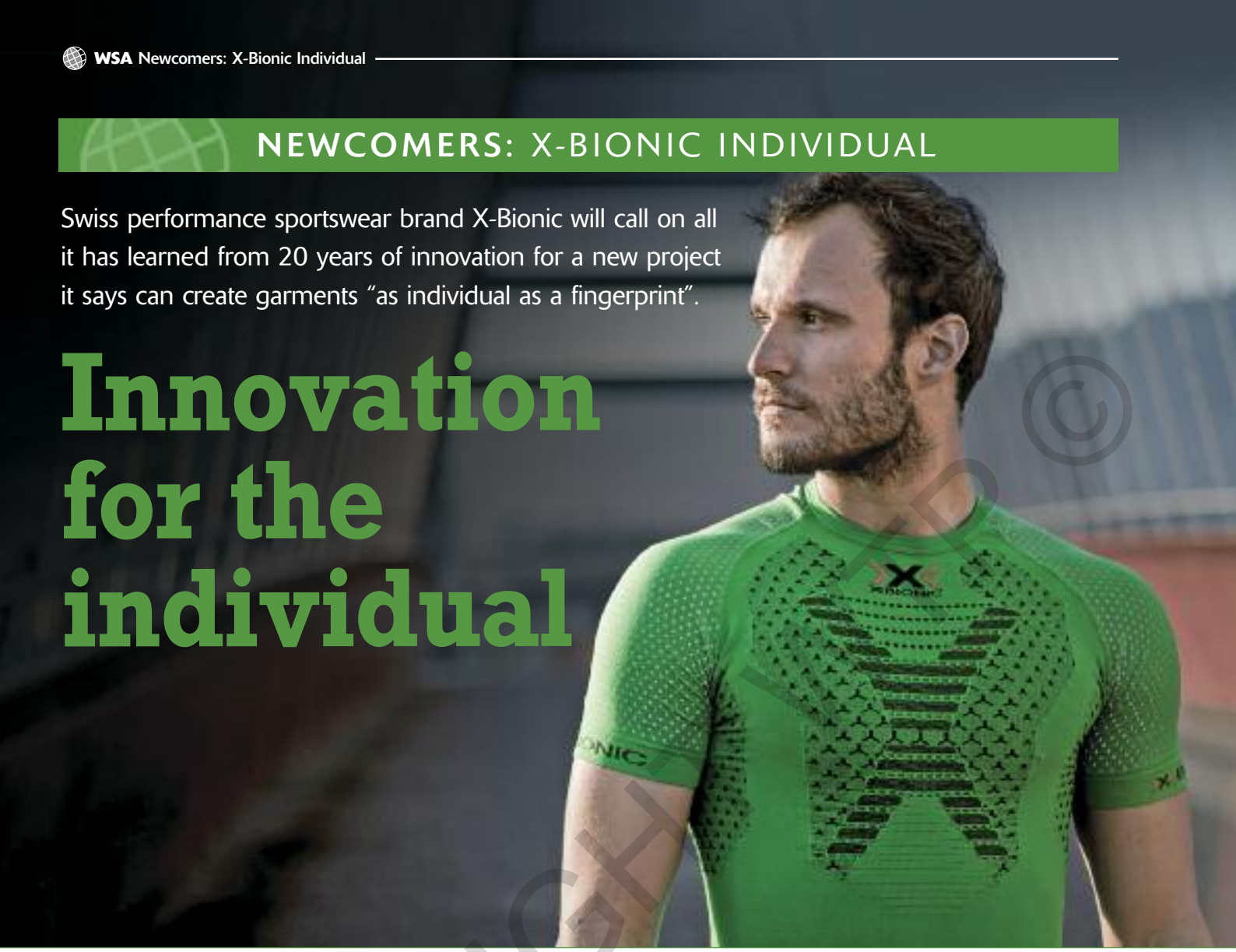
## NEWCOMERS: X-BIONIC INDIVIDUAL

Swiss performance sportswear brand X-Bionic will call on all it has learned from 20 years of innovation for a new project it says can create garments "as individual as a fingerprint".

# Innovation for the individual



"Sweat is too precious to waste"; that is the mantra of Professor Bodo Lambertz, founder and chairman of sports apparel developer X-Bionic, as he runs his company. An industrial engineer by trade, his first foray into the textile industry came with the development of a new functional sock. This is now the principal domain of sister company X-Socks. The functional apparel arm of the business designs and manufactures garments for a wide range of sports and activities, including cycling, running, winter sports, golf, tennis and even motorsports.

What differentiates X-Bionic from other sports apparel developers is its treatment of sweat. While some its competitors pride themselves on having created clothing capable of wicking every last drop of sweat from the body, the Swiss company has instead dedicated its research efforts to developing technologies and materials that redirect this important fluid to where it is most needed.

Professor Lambertz says sweat is essential for achieving optimal performance as it is the body's way of cooling down when it overheats. This takes place when the sweat evaporates. X-Bionic's technologies are intended to complement the body's natural cooling system rather than working against it. If an athlete's clothing wicks all the sweat away, they are deprived of a vital cooling tool. It will also cause the body to produce more sweat, using up its store of water, minerals and salt. The company believes nature knows best; if the human body has evolved over millions of years to sweat when it becomes too warm, this must be the best possible solution to the problem of overheating.

### Cool solutions

The company's 3D Bionic Sphere system allows for excess sweat to be removed from the body via a series of channels while still leaving a thin layer of moisture on the skin. This gives the wearer the cooling benefits of sweat evaporation without them experiencing a feeling of wetness. This system is incorporated into the zones of a garment from which an especially high quantity of heat and sweat is released. These include the chest, the back and the armpits.

In some products, the system is supported by a special woven structure that helps transport the excess moisture away. This is achieved through what X-Bionic calls a "push-pull effect", generated by a combination of hydrophobic and

*X-Bionic's 3D Bionic Sphere sweat management system is integrated into a range of products, including the Twyce running shirt, which also features a special woven structure that helps transport excess moisture away.*

*Patrick Lambertz*

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hydrophilic yarns. The hydrophobics yarns drive the moisture away from saturated hydrophilic zones. The hydrophilic yarns absorb sweat on the fibre surface, allowing it to be evaporated quickly. They also attract more sweat from the hydrophobic zones, distributing it over a larger area for greater cooling.

Not long after the system was developed, a study at the University of Dortmund in Germany found that athletes taking part in endurance sports use up to 97% of their energy just for thermoregulation. X-Bionic's theory is that if its technology can reduce this percentage, the athlete will have more energy to dedicate to their performance.

The 3D Bionic Sphere System is also beneficial when the body cools during rest. As the body temperature falls, the same channels used to transport the excess moisture away during exercise trap warm air inside and act as a form of insulation. This avoids overcooling, reducing the risk of muscle strains or tears following exercise.

ThermoSyphon technology, based on this system, will be incorporated into X-Bionic products from 2019.

With one of its more recent innovations, which it calls 'The Trick', it has taken its research and development a step further than complementing the body's natural cooling system. As the name might suggest, this technology essentially tricks the brain into thinking the body temperature is higher than it is. This is achieved with the help of a special insulation zone placed on the spinal column, which creates a local heat zone precisely where there are heat receptors under the skin. This prompts the brain to start sweat production, even though in reality the body is still at optimal temperature. The prematurely-created sweat is collected and transported to the points on the body in need of cooling. This saves the athlete energy later on.

## Nature knows best

X-Bionic's acceptance that nature knows best when it comes to finding solutions to problems extends to the animal kingdom. Its 'Thorny Devil' technology is inspired by a species of Australian lizard. Also known as the mountain devil, it lives in the desert and has evolved a system of channels on its body for transporting moisture from the air to its mouth. X-Bionic adapted this trait to athletic apparel, using it to strategically transport sweat to the parts of the body in need of urgent cooling. There are three stages to the process: collection, transportation and distribution. The structure of the HydroPort yarn used in the second stage are based on the tiny channels the thorny devil ingeniously uses to quench its thirst. One use for this system is in cycling apparel, where it can be employed to transfer the sweat that accumulates around the cyclist's abdomen and back to heat-intensive muscle areas like the thighs. Here it can evaporate, providing important cooling for overheated muscles.

Another of its innovations, 'Fennec', takes its name from a breed of nocturnal desert fox known for its large ears, which help to dissipate heat. This animal also has a kind of glossy fur that reflects the heat radiated by the sun and by its surroundings. X-Bionic drew on this to develop its Xitanit fibre, which reflects external radiated heat. This means the material heats up on the outside but remains cool on the inside. It also draws heat away from the body before the material's conductivity helps dissipate it. The company compares this to the effect of a silver spoon in a hot cup of tea. A special knitting technique creates micro ducts in the garment which move the sweat to the outer surface to be evaporated. Some of the moisture condenses, however, and is absorbed back into the skin in a cooler state.

X-Bionic claims its 'Symbionic' membrane is more effective than conventional membranes due to its ability to transport both water vapour and water droplets. The inspiration this time was the skin-breathing capabilities of amphibians, more specifically the salamander. The Symbionic membrane has no pores, which the company says means there is no risk of them becoming blocked. Its structure breaks down larger drops of sweat to be broken down before they are drawn into the membrane. The moisture is then driven from the outer surface of the membrane by the body's own heat. This leaves the inside dry, which is in contrast to conventional PTFE membranes which can become clogged, leaving water droplets on the inside of the garment and causing wetness.

## Too much of a good thing

Although X-Bionic agrees with industry consensus that compression clothing can support and even enhance athletic performance, it also believes too much compression can have a negative impact on the body's capacity for thermoregulation by inhibiting blood circulation. It has tried to combat this issue with its partial compression technology, which it says offers the benefits of compression without inhibiting cooling. This is achieved by applying targeted pressure using

*'The Trick' technology, featured here on the rear of a cycling bib short, tricks the body into prematurely releasing sweat which is then diverted to cool overheating muscles.*

*X-Bionic*




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narrow compression ridges. Either side of these ridges are compression-free areas, ensuring blood flow through the veins and capillaries to remain unimpeded. The absence of full compression also allows some sweat to remain on the skin, which can then evaporate to help the blood stay cool.

Testing carried out in 2013 by the Centre for Mountain Sports Research and Health (CeRiSM) at the University of Verona in Italy offered insight into the benefits of X-Bionic's 'Partialkompression' technology. In its findings, it said the technology resulted in half the increase of body heat compared to full surface compression, and that the oxygen level recovery of the muscles occurred 20% faster. It was also found to result in a lower heart rate of the wearer and a 7% reduction in lactate concentration in the blood, a cause of muscle fatigue.

## Fit for purpose

The technologies already mentioned, as well as many more that the company has developed during its 20-year history, will be applied to a new project it unveiled in May. Known as 'Individual', it will see top athletes offered fully individualised functional clothing. Professor Lambertz tells *WSA* the most important part of the process is to get the "vital parameters" of the athlete's body right. He explains that when X-Bionic says 'Individual' it does not mean providing one of its regular garments in the athlete's favourite colour. Instead, it is promising clothing designed specifically for that person with their exact requirements taken into account. When announcing the project, it pledged to create garments "as individual as a fingerprint".

The first stage of the process is a thorough analysis of the athlete's physical medical history. This must be as detailed as possible because when it comes to competing in extreme conditions and under extreme stress, such as during marathons, ultrarunning competitions or extreme biking events, the company says "even the smallest of details is decisive".

The company will take measurements of the athlete's proportions at its headquarters near to Lake Zurich using a scanner capable of measuring with "millimetre accuracy". The athlete is then put through a 45-minute stress test, during which a 360-degree measurement of sweat distribution is taken. For this testing to be effective, they must be pushed to their limits. What follows is "zoned measurement" of thermal changes, sensory checks and the recording of "motion tendencies". The amount of sweat absorbed by the garments the athlete wears during the assessment will be weighed to one hundredth of a gram-.

At the end of the analytical phase, X-Bionic will use the data it has collected to create a personal avatar of each athlete before putting together "optimum technologies" to suit each person. Once a decision has been made on which to integrate into the garments, they will be manufactured at the company's Future Factory, the advanced production facility it unveiled at the end of 2017.



*During the analytical phase of the 'Individual' project, the athlete is pushed to their limits. Here, German triathlete and ironman competitor Timo Bracht undergoes an assessment of his sweat distribution during exercise.*

*X-Bionic*

In February 2018, X-Bionic confirmed that Italian seamless technology specialist Norman Group would be its new production partner. This followed news it had decided not to continue its 20-year relationship with Trerè Innovation. Together, the new partners will manufacture products using what they call 'Retina High Definition Technologie'. This process employs a considerably higher number of needles to achieve a finer knitting resolution. The technique will be especially useful when creating garments for the 'Individual' project as a high level of accuracy is required to place fibres and yarns in the optimum position for that athlete. The partnership will also result in a three-fold increase in the production capacity, which the company says will allow it to satisfy increasing global demand for its products.

Appointments for the 'Individual' project will start at the beginning of 2019. The package costs each athlete €2,000, which includes three customised garments. X-Bionic believes it is suitable for athletes from a wide range of sports. With its extensive catalogue of innovative products, materials and technologies, X-Bionic looks to be in a position to take customisation to the next level.

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