

Southern African Institute of Forestry



Delivering a professional service to forestry

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From the President's desk

What is biomimicry? "Biomimicry is the practice of looking to nature for inspiration to solve design problems in a regenerative way". It is a new science that attempts to solve the problems facing humanity by learning from and then emulating nature's forms, processes, and ecosystems to create more sustainable designs and solutions. Biomimicry is innovation inspired by nature that allows humans to sustainably harness nature for their own benefit. The biomimicry approach to design and engineering is unique in that design imitates functional strategies from the natural world that developed as a result of 3.8 billion years of evolution. By using nature as a design model, humans will be able to provide efficient, innovative and sustainable solutions conducive to life on earth.

Examples of biomimicry in practice today:

Whales and wind power. Humpback whales are extremely efficient at catching krill and schools of fish. Despite their size, humpbacks can swim in tight circles to produce bubble nets that then trap their prey. Their ability to swim in tight circles is controlled by their flippers, the leading edge of which is lined with large, irregular bumps called tubercles (Figure 1). Contrary to popular belief, had the humpbacks' flippers been smooth, their ability to turn sharply in the water would not have been possible, thus these tubercles provide the whales with the "grip" in the water they need to enable them to feed. This interesting flipper design has now been applied to how we design wind turbines. It has been found that turbine blades that are designed with a bumpy-



2021 Calendar Winning Photo by Jos Louw (S-Cape) :
Lesser Double Collared Sunbird: January 2021



leading edge produce more energy, more efficiently because the bumps (tubercles) reduce drag and are more aerodynamic than a smooth blade (Figure 2).



Figure 1: Humpback whale flipper tubercles.

Termites and temperature regulation. Termites are extraordinary architects and masonries that can build mounds up to five metres tall. The height of a termite mound is not all there is to marvel about, because the design within the mound is just as impressive. In Zimbabwe, termites build their mounds to farm a fungus, their primary source of food. For the fungus to grow, it must be kept at a constant temperature (30.6°C), while the ambient temperature outside the mound varies greatly during the day and night. The termites achieve a constant temperature in the mound by regulating airflow through the mound, by opening and closing heating and cooling vents. Air is drawn in near the base of the mound, the air is cooled in the lower chambers and then channeled toward the peak of the mound, where it is released. In Zimbabwe this air flow design has been applied to the Eastgate Centre to mitigate the need for expensive air conditioning systems. The outside air is warmed or cooled by the building's mass, it is then channeled into the building's floors and offices before exiting via the building chimneys.

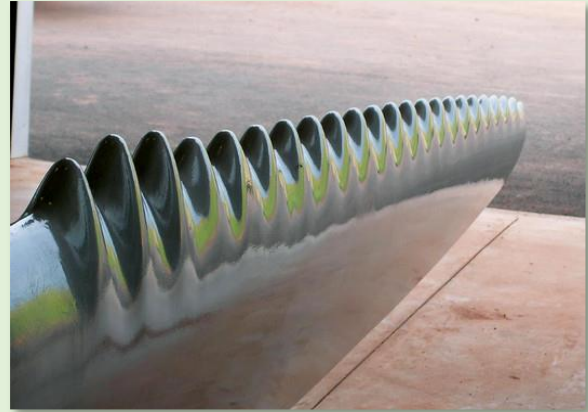


Figure 2: Tubercles on the leading edge of a wind turbine blade.

Think like a tree. Oak trees have the amazing ability to withstand hurricane conditions. This is due to their spiral-shaped trunk and branches, which allow oaks to flex with the windy conditions. Oak tree leaves will also curl during extremely windy conditions to allow air flow through them with less friction, the leaves are thus less likely to fall off. Additionally, the roots of an oak tree intertwine with the roots of the neighboring oak, anchoring one another. This natural design can be applied to the architecture of houses and communities in hurricane-prone areas to reduce the damaging effects that hurricanes have on infrastructure. One idea may be to build houses in a community with horizontal foundations that anchor one another to improve their durability and safety in the future.

Shark skin as a repellent for bacteria.

Shark skin is well adapted to resist the attachment of living organisms such as bacteria, algae and barnacles. This idea of resistance to microbes inspired scientists to the develop a shark skin-like material, infused with antimicrobial agents to coat high-contact areas in hospitals to prevent the growth and spread of bacteria (Figure 3). Scientists found that the shark skin coating, without antimicrobials, reduced the attachment of *Escherichia coli* (*E. coli*) on the surface by 70%. Furthermore, researchers found that after adding antimicrobials to the coating, the bacterial load was further reduced, with 95% of *E. coli* and 80% of



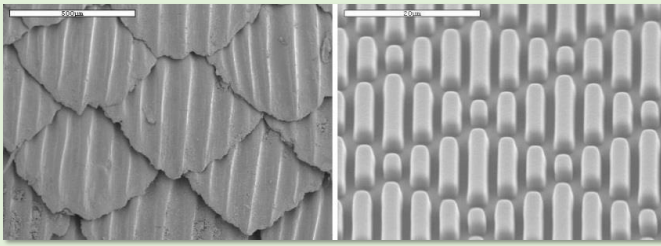


Figure 3: Magnification of shark skin (left) and magnification of antimicrobial shark skin-like micropattern infused with antibiotics (right), used to coat hospital surfaces.

Staphylococcus aureus effectively killed within an hour.

Carbon-fibre epoxy honeycombs mimic the material performance of balsa wood. Scientists at Harvard University have created lightweight cellular composites via 3D printing (Figure 4). These fibre-reinforced epoxy composites mimic the structure and performance of balsa wood. Since the fibre fillers align along the printing direction, their local orientation can be exquisitely controlled. These 3D composites may be useful for wind turbine, automotive and aerospace applications, where high stiffness- and strength-to-weight ratios are needed. Balsa wood has a cellular architecture that minimizes its weight since most of the space is empty and only the cell walls carry the load. It therefore has a high specific stiffness and strength.

Considering the examples above and calls to reduce the use of synthetic plastics, finding alternative solutions is increasing. Proteins, carbohydrates, biopolymers and minerals form the building blocks for all light-weight coverings of organisms that abound in nature. These include cuticles, bark, exoskeletons, shells and skin allowing for protection from impact, communication through visual cues, management of oxygen, moisture and microbes, to name a few. Thus, what types of new innovations in packaging or other applications could be found, rather than conventional synthetic plastics, by looking at the principles behind multi-functional coverings in nature? Feedstocks abound in many industrial processes, both in primary production and waste streams, such as chitin from the shellfish industry, keratin from chicken feathers, cellulose from pulp, paper and timber. We can put these to use as feedstocks in a new biomimetic materials system that produces new materials based on nature's design principles.

Biomimicry is a systematic approach to tapping into that knowledge base and translating nature's design principles into new problem-solving concepts. This is where knowledge, technology and creativity merge. Advanced microscopes and other analytical tools are increasing our detailed understanding of how the natural world works. Additive manufacturing, of which 3D printing is just the tip of the iceberg, is enabling the manufacture of hierarchical materials from the bottom up with greater dexterity, just like in nature. Similarly, computing power is enabling researchers to rapidly test new biomimetic ideas so that inventors can choose the most promising ones to test at the lab bench. For all the challenges we face, nature has a solution. Biomimicry offers us an empathetic, interconnected understanding of how life works and ultimately natural solutions we can exploit.

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- <https://www.designnews.com/electronics/transparent-oled-wireless-mergers-and-more-supplier-news>
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The Rob Thompson Column: Natural cycles

Any high hopes you may have had, of 2021 showing a marked improvement on 2020, have presumably now been dashed with the announcement of an extended level 3 lockdown? All manner of debate has ensued as to the merits of the decisions taken and the harsh restrictions that have been placed on the populace.

I'm sure that I'm not the only one sensing heightened dread by all manner of people having to deal with dire, uncertain and unprecedented circumstances. Supposed simple tasks such as renewing vehicle licenses have become marathon events stretching into days and even months to accomplish. COVID is being contracted by people from all walks of life now and there seems to be no end in sight to the current second wave, and the pandemic in general.

What to do and how do we come to terms with what is happening out there?

How do we deal with the situation and maintain our sanity and a positive outlook? During my recent leave period, I dwelled on this topic for a while and interestingly a few forestry analogies came to mind that rapidly developed into a thought process leading to a conclusion that we are experiencing one of countless, repetitive, integrated cycles of life, refuting our common contention that we are experiencing a "new normal".

Our plantations are caught up in a vortex of change and renewal. Natural regeneration to seedlings to selected seedlings to clones to hybrid clones to specific breeding to micro propagation to who knows what new discoveries await. This all to keep ahead of natural factors (pests, climate etc.) causing mortality and production loss.

Silvicultural cycles started out initially with simple manual operations leading to more mechanized operations leading to chemical regimes leading to bio-controls leading to who knows what other protocols await to assist us in our war against natural factors (weeds, terrain, water runoff etc.).

Foresters were initially employed as generalists, leading to functionalization leading to specialty fields leading to virtual management leading to who knows what other approaches are to be discovered.

These basic forestry related cycles led me to the thought that mankind has allowed itself to get caught up in an expanding survival or production cycle which since the discovery of fire has been destined for disaster if not well managed. The further discovery of the likes of wheel, machines, weapons, comfort items, medicines, medical technologies and single use plastics has led to off-balance natural cycles, over population, excessive waste, toxins, stresses, resource shortage and conflict.

To substantiate this, I wandered off down the path of reminiscence, towards those that were my parents' experiences. They were both nearing the end of their schooling with expectations of starting up careers when all hell broke out in the form of a second global conflict close on the heels of the first global war that should have ended all wars. Rather than becoming an engineer my Dad found himself an airborne soldier in dire circumstances that were certainly not of his choosing. Horrendous global mortalities resulted during the conflict years until it all ended (temporarily) via the annihilating power of a split atom. Sporadic conflict has flared up across the globe regularly from that period onwards and will likely continue until who knows what puts an end to humanities' natural intolerance and when.

Demand for scarce resources, whilst leading to innovative solutions, are invariably leading to excessive waste, pollution and inevitable change or destruction of key natural process. Illustrating this is the estimation that more than a third of the global space, once taken up by our precious water resource, now comprises plastic waste. Adding further angst to this mental image is the fact that more than a half of the original global high forest area now comprises either wasteland or grazing and each lungful of air that we breathe has more toxins than we would care to know about.



Who knows if we are going to be affected by all of this? Hang on a bit...we do know! A culinary encroachment into those which ought to have been considered non-edible animals, has resulted in the crossing over of a SARS type virus to humans and you and I are both being targeted as we well know. This too shall however end. The waves will dissipate, a vaccine or control or protocol will contain the virus and global life will continue its cycle, well at least until who knows what.

All of these ramblings are certainly not to create the view that all is lost. They just led me to conclude that whichever way we look at it, we are part of a bigger series of cycles. The “new normal” has been a fact for millennia. We can influence these cycles either positively or negatively. In my opinion the negative influence we have collectively had on natural cycles to date has resulted in our current circumstance but perhaps knowledge of that reality assists us to come to terms with the fact?

What it is what it is, and despite the horror of which we are facing, we can each still consciously take individual decisions to tread lighter, waste less and use resources appropriately.

This positive approach will not cure the ills of the world but will certainly emphasize, most importantly to ourselves, that our destiny ultimately lies in our own hands.



Mike Hunter receives his prize from Stihl for his photo in the 2021 annual SAIF Calendar photo competition

FORESTRY MASTER PLAN



Taken from FSA December newsletter with permission : – Forestry masterplan

The Forestry Sector Masterplan is one of a number that emerged from a call for action by President Cyril Ramaphosa to stimulate the economy.

Why prioritise the Forestry Sector?

The Forestry Sector contributes almost 25% to the agricultural GDP, with forestry products contributing at least 4.5% of South Africa’s total manufacturing GDP – making it among the top five sectors within manufacturing. In less than 10 years, export earnings have almost trebled, with the Sector providing a positive trade balance close to R10 billion. Furthermore, much of forestry operations are rurally based, making it a significant contributor to rural economies and social well-being. It is estimated that the Sector supports some 700 000 livelihoods. With land reform, if expedited and effectively implemented, potentially resulting in as much as 50% black and community ownership of land available for plantations.

Why a Masterplan?

The Masterplan is a high-level action plan that nevertheless provides detailed implementation and Monitoring and Evaluation (M&E) plans. As such, it provides a solid basis from which delivery can proceed. It should be noted that while action-orientated, the Masterplan is still a plan, and constitutes just 10% of what needs to be done – provision still needs to be made for 90% of efforts and resources for implementation. The primary objective of the Masterplan process, underpinned by the Public Private Growth Initiative (PPGI) is to develop an agreed-upon set of actions, with time frames, that all stakeholders in a sector or value-chain commit to implementing for the benefit of the sector or value-chain.



The primary objective of the Forestry Masterplan is to increase investment, job and competitiveness, underpinned by greater inclusivity in the Forestry Sector, which will be applied across five subsectors of the Forestry value chain: 1. Primary sector, 2. Pulp and paper, 3. Sawn timber, 4. Board products, 5. Utility poles and treated products.

The seven key focus areas

Expanded forestry resource and maintenance/protection – the success of the Forestry Sector hinges on the ability of timber growers being able to supply sufficient raw material for present and future market demands. Current supply is already being outstripped by demand, with present and future demands set to expand exponentially, it is essential that the Sector bolsters its supply and protects its current resources from threats like fire, pests, diseases and criminal activities.

Transformation – the Forestry Sector offers a unique synergy between growth of the Sector and transformation – through progress in land reform, recapitalisation of State plantations (B&C and Exit) and the provision of significantly enhanced extension services and other forms of support to community and black businesses throughout the value chain.

Processing – the South African Forestry Sector is only as strong as the processing sector which ultimately needs to convert relatively low-value roundwood into forest products. The local timber processing sector must remain competitive in the international markets to benefit local roundwood supply originating and providing livelihoods in the rural economy.

Illegal timber and crime-related activities – are becoming a growing concern for the Forestry Sector, which due to its large land base finds it difficult to have sufficient resources to protect forestry assets from criminal activities encompassing a variety of illegal practices across the value chain. It is exacerbated by the justice system (from policing to sentencing) not appreciating the severity of the problem.

Research, development, innovation and skills development – the South African Forestry Sector is based on a long and rich history of sound research and development practices. However, the industry is currently faced with several challenges related to existing levels of public investment in RDI, as well as the development and retention of the necessary expertise and skills.

Key inhibitors – a variety of inhibitors facing the Forestry Sector have emerged, including water, with plantation forestry recognised as the only streamflow reduction activity and therefore requiring a water use licence; Genus Exchange Legislation; diesel refund exclusions; port costs and challenges around efficiencies, contamination, maintenance and turnaround time; transportation costs surrounding both road and rail; environmental impact assessments (EIA) for community plantation projects and small developments where it is a major stumbling block.

Institutional development

These will play different roles in contributing to the goal statement, with growth and improvement measured against several factors including investment, jobs, competitiveness and inclusiveness, although the Masterplan does have two headline targets:

- R24,9 bn to be invested, of which R8,4 bn had already been invested at the time of finalising the Masterplan. A further R14 bn could follow pending the removal of some inhibitors, bringing the total investment to R38,9 bn.
- 100,549 additional jobs of which the bulk will come from new afforestation (projected 60 265 jobs).

Targets the Sector looks forward to meeting.

Responsible forestry requires attention to sustainable, efficient and effective practices that have the lowest environmental impact and yield the greatest [social](#) and [economic](#) benefit, while producing an array of renewable and versatile [end-products](#). To this end, Forestry South Africa (FSA) represents 11 corporate forestry companies, approximately 1 100 commercial timber farmers and some 20 000 small-scale growers. Collectively, these growers own or control no less than 93% of the country's total plantation area of 1.2 million hectares. It supports the Industry in common and precompetitive areas such as research and protection and against pests and disease, environmental issues, education and training and legislation.

[Commercial forestry](#) is much like any other farming practice. The crops are considered a renewable resource, used to make sawn timber, pulp, paper, poles, mining timber, matches, charcoal and cellulose-based products. Specific species of trees are planted, harvested and replanted in sustainable rotation.



Widdringtonia nodiflora



This species is perhaps not as famous as its relatives namely the Clanwilliam Cedar and Willowmore Cedar but is widespread in the Fynbos biome and can be seen on many mountain slopes throughout large parts of the Cape Provinces and further afield.

The indigenous *Widdringtonia nodiflora* is an evergreen tree with a columnar crown. As its common name suggests, 'Mountain cedar' tree is found growing naturally on high altitudes between rocks and in gullies, on mountainsides, among fynbos and grassland types. This tree is widely distributed, from the southwestern Cape through KwaZulu-Natal to parts of Zimbabwe. This tree has the ability to regenerate quickly after a fire.

Leaves of the Mountain cedar are found at the ends of mature branches and are in opposite (usually) or alternate pairs. Young leaves are light, bright green and needle-like; as they mature they become scale-like and flatly pressed against the young stems. The grey bark peels off frequently, revealing the inner red layer. This monoecious tree produces yellow [male] and brown [female] cones on the same tree.

Mountain cedar's features are close to those of the traditional Christmas tree hence it can be considered as a substitute for the Christmas tree. This tree can reach a mature height between five and seven metres. The root system of *W. nodiflora* is non-invasive making it suitable for growing in containers. *W. nodiflora* is both frost hardy and drought resistant.



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Paper Recycling Tips

According to **RecyclePaperZA**, the paper recycling association of South Africa, white or office paper is among the least recycled products in South Africa. This is largely due to filing and piling of documents.

One tonne of recycled paper, however, can save up to three cubic metres of landfill space. The 1.2 million tonnes of paper and paper packaging responsibly discarded and recycled in South African in 2019 saved 3.6 million cubic metres of landfill space. That's the same as 1 442 Olympic-sized swimming pools! Sadly, a significant amount of recyclable paper and packaging is thrown away with food or garden waste, ending up in a landfill.

Paper recycling tips

- Always have a separate bin, box or bag for your paper recycling. This keeps it clean and dry.
- Decide what you will do with your paper recycling – separate it for a waste collector or drop it at a recycling centre.
- Do not mix your paper with other recyclables.
- Get to know what is recyclable and what is not.
- **Recyclable:**
 - ✓ Office paper
 - ✓ Cardboard boxes
 - ✓ Beverage cartons – both long-life milk and juice and refrigerated
 - ✓ Paper coffee and soft drink cups
 - ✓ Magazines
 - ✓ Newspaper
- Paper packaging for cereal, toothpaste, medicine and cosmetics without plastic laminates or excessive foil embellishments.
- **Not recyclable:**
 - ❖ Foil gift wrapping and foil lined boxes
 - ❖ Wax coated or laminated boxes such as frozen food boxes
 - ❖ Empty cement and dog food bags
 - ❖ Disposable nappies
 - ❖ Carbon paper
 - ❖ Sticky notes

OFFICE PAPER

- Keep white paper in a separate bag to other paper products if you can.
- Avoid crumpling paper into a ball – flat is best as it takes up less space in a waste collector's trolley.
- Remove plastic covers or binder spines before putting your paper in the recycling bag.
- For confidential documents, it is best to tear these up – preferably down the middle of the page. Shredding often presents problems for recycling operations as it shortens the paper fibres and diminishes the quality of paper for recycling. Shredded paper is also difficult to bale.

PACKAGING

- Flatten the hoard of cardboard boxes from your online shopping and place next to your bin on rubbish collection day. Waste collectors will be grateful!
- Remove any plastic elements and recycle these with your plastic – if they are recyclable.

WRAPPING PAPER

- Avoid using foil-based gift wrap, as this is not recyclable. Opt for patterned paper gift wrap or brown kraft paper to package your gift.

LIQUID PACKAGING

- Milk, juice, custard and wine cartons are recyclable in South Africa. Empty, rinse slightly, lift the corners, flatten and replace the cap.
- Push straws into little juice boxes.
- Coffee cups are also recyclable!

These items were given out to the less fortunate in boxes. The 1.2 million tonnes of paper and paper packaging recycled in South Africa in 2019 would, when baled:

- Stretch from Kempton Park to Cape Town if the bales were laid end to end.
- Fill 1 442 Olympic swimming pools.
- Cover 219 soccer pitches, one bale deep.

For more information about paper and paper recycling, visit www.recyclepaper.co.za. You can also visit www.mpactrecycling.co.za for a list of recycling centres and paper banks.

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The Southern African Institute of Forestry

Handbook order form

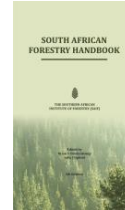
The Southern African Institute of Forestry publishes three industry specific handbooks.

I would like to order:

South African Forestry Handbook

Price: SAIF members: R400

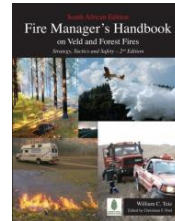
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Fire Manager's Handbook on Veld and Forest Fires

Price: SAIF members: R300

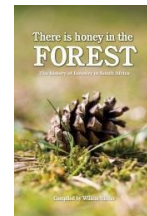
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There's Honey in the Forest

Price: SAIF members: R100

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