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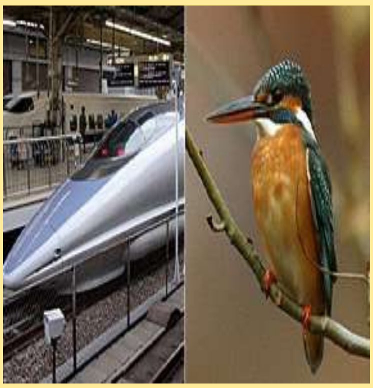
BIOMEMITICS

It is defined as the study of the formation, structure or function of biologically produced substances and materials and biological mechanisms and processes especially for the purpose of synthesizing similar products by artificial mechanisms which mimic natural ones.

Biomimetics could in principle be applied in many fields. Because of the diversity and complexity of biological systems, the number of features that might be imitated is large.

Locomotion

Aircraft wing design and flight techniques are being inspired by birds and bats. The aerodynamics of streamlined design of improved Japanese high speed train Shinkansen 500 Series were modelled after the beak of kingfisher bird



Biomimetic Architecture

The core idea of the biomimetic architecture is that nature's inhabitants including animals, plants, and microbes have the most experience in solving problems and have already found the most appropriate ways to last on planet Earth.

Wind turbines modeled after Humpback whales

Tests conducted by the U.S. Naval Academy, using model flippers, determined these biomimetic fins reduced drag by nearly a third and improved lift by eight percent overall.

Cephalopod camouflage

Squids, like all cephalopods, are capable of glowing as well as changing their skin color. This camouflaging capacity enables them to hide from predators.

Researchers at the University of Houston have developed a similar device capable of detecting its surrounds and matching this environment in seconds.

S. Giridhar Rao
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IV-ME

Pandemic Effects our Engineering Trends

For now, the COVID-19 pandemic is first a health and humanitarian crisis, and businesses are rapidly adjusting. While the crisis unfolds, leaders should also prepare for what is coming next. But not the next 'normal'. Normal isn't available to us anymore, and 'business as usual' even less.

The new reality taking shape is made of complexity, uncertainty and opportunities. To adapt and thrive, organizations must accelerate and become resilient and agile. Accenture can help leaders and organizations address the deep changes needed in this new environment, from a people, operations, and technology perspective, at speed and at scale.

Aerospace and Defense

As part of a critical infrastructure industry, aerospace and defense leaders must respond to the immediate crisis now while also planning for new ways of working which will emerge as COVID-19 infection cases begin to decline in the coming months.

Airlines are cutting immediate capacity in the range of 40 to 100 percent and asking for deferrals, model switches and cancellations on orders. Most major civil aircraft assembly plants are closed indefinitely or operating at a vastly reduced volume. These lower production rates are rippling down to the supplier network as production is paused and workforces furloughed.

Automotive

Most car manufacturers have been facing a perfect storm of challenges since 2019 which are mainly driven by Connected, Autonomous, Shared and Electric mobility (CASE). These circumstances have only been exacerbated by the onset of COVID-19, a global pandemic that is affecting every aspect of the automotive sector from parts suppliers all the way to dealers.

Challenges brought on by COVID-19

- Disrupted Supply Chain
- Shut down of Manufacturing
- Liquidity
- Drop in Vehicle Sales

Automotive companies should develop a rapid response to address these current disruptions. They should look into strengthening operations in preparation for potential risks and adjust to this “new normal”. A crisis control tower can help to coordinate these actions.

Railways

Rail and transit business continuity is essential for the movement of health, medical and other essential personnel but it is also a potential vector for the spread of the disease.

As economies emerge from the pandemic, operators must adapt practices to build customer and employee confidence while improving emergency measures to support business continuity and to build resiliency in operations.

Capital Markets Industry

The COVID-19 pandemic is a profound health and humanitarian crisis that massively challenges the financial and operational resilience of the global Capital Markets industry. The outbreak has initiated a call to action for leaders worldwide to rapidly assess the fast-changing developments, and to mitigate the ensuing impact on their people, their customers and their organizations. We believe this unprecedented set of challenges should be addressed in three phases: Stabilization, Reconfiguration and Recovery.

Stabilization

The global Capital Markets industry is a highly interconnected—and sometimes fragile ecosystem. Working with regulators, governments and trade bodies, industry players must collectively identify points of dislocation and react accordingly to prevent economic contagion and dangerous “beggar thy neighbor” behavior.

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III-ME

SHAPE MEMORY ALLOYS

Shape memory alloys (SMA's) are metals, which exhibit two very unique properties, pseudo-elasticity, and the shape memory effect. Arne Olander first observed these unusual properties in 1938 (Oksuta and Wayman 1998), but not until the 1960's were any serious research advances made in the field of shape memory alloys. The most effective and widely used alloys include NiTi (Nickel - Titanium), CuZnAl, and CuAlNi.

Working of Shape Memory Alloys

The two unique properties described above are made possible through a solid state phase change, that is a molecular rearrangement, which occurs in the shape memory alloy. Typically when one thinks of a phase change a solid to liquid or liquid to gas change is the first idea that comes to mind. A solid state phase change is similar in that a molecular rearrangement is occurring, but the molecules remain closely packed so that the substance remains a solid. In most shape memory alloys, a temperature change of only about 10°C is necessary to initiate this phase change. The two phases, which occur in shape memory alloys, are Martensite, and Austenite.

Martensite, is the relatively soft and easily deformed phase of shape memory alloys, which exists at lower temperatures. The molecular structure in this phase is twinned which is the configuration shown in the middle of Figure 2. Upon deformation this phase takes on the second form shown in Figure 2, on the right. Austenite, the stronger phase of shape memory alloys, occurs at higher temperatures. The shape of the Austenite structure is cubic, the structure shown on the left side of Figure 2. The un-deformed Martensite phase is the same size and shape as the cubic Austenite phase on a macroscopic scale, so that no change in size or shape is visible in shape memory alloys until the Martensite is deformed.

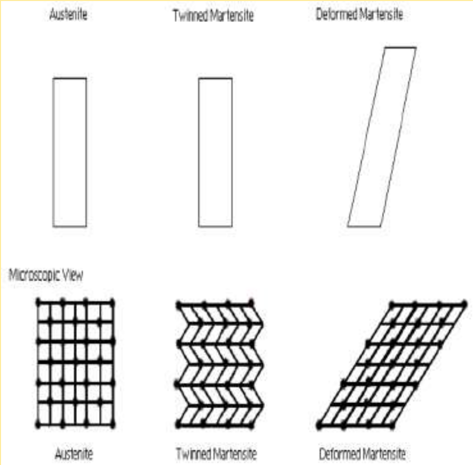

Fig.1. Microscopic and Macroscopic Views of the Two phase of Shape Memory Alloys

The temperatures at which each of these phases begin and finish forming are represented by the following variables: Ms, Mf, As, Af. The amount of loading placed on a piece of shape memory alloy increases the values of these four variables as shown in Figure 3. The initial values of these four variables are also dramatically affected by the composition of the wire (i.e. what amounts of each element are present).

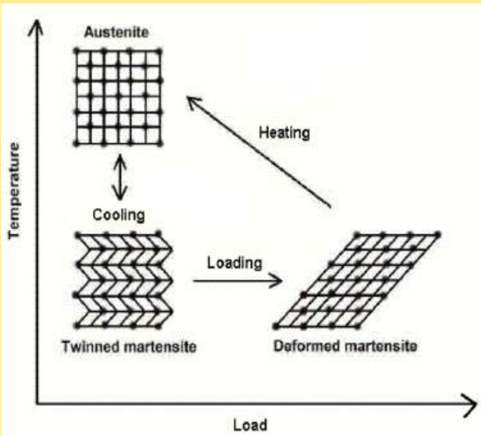

Fig.2. Microscopic View of Shape Memory Alloy

The shape memory effect is observed when the temperature of a piece of shape memory alloy is cooled to below the temperature Mf. At this stage the alloy is completely composed of Martensite which can be easily deformed. After distorting the SMA the original shape can be recovered simply by heating the wire above the temperature Af. The heat transferred to the wire is the power driving the molecular rearrangement of the alloy, similar to heat melting ice into water, but the alloy remains solid. The deformed Martensite is now transformed to the cubic Austenite phase, which is configured in the original shape.The Shape memory effect is currently being implemented in:

- Coffepots
- The space shuttle
- Thermostats
- Vascular Stents

Hydraulic Fittings (for Airplanes)

Advantages

Some of the main advantages of shape memory alloys include:

- Bio-compatibility
- Diverse Fields of Application
- Low operation Voltage
- High Specific Strength
- High Frequency response
- MEMS
- Compactness and lightness
- High damping capacity

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II-ME

COMIC


It's Sunday, and something is off.
As college students,
Looks like I'm actually free for once!
the concept of 'free' time
I'm going right back to sleep.
is merely an elaborate...
* 1 hour later ~
Bro you missed extra class at 8.
Extra class?!
Lol.
?
hypothesis.
In CAT-2, some can't find answers...
Me fail.
TIME UP!
No matter how hard they search.
BS
Then there's me who finds them all...
Me fail.
NO MORE EXTRA TIME!
... and copies them all, with the wrong values.