



Ontwerpen voor nieuwe productietechnieken

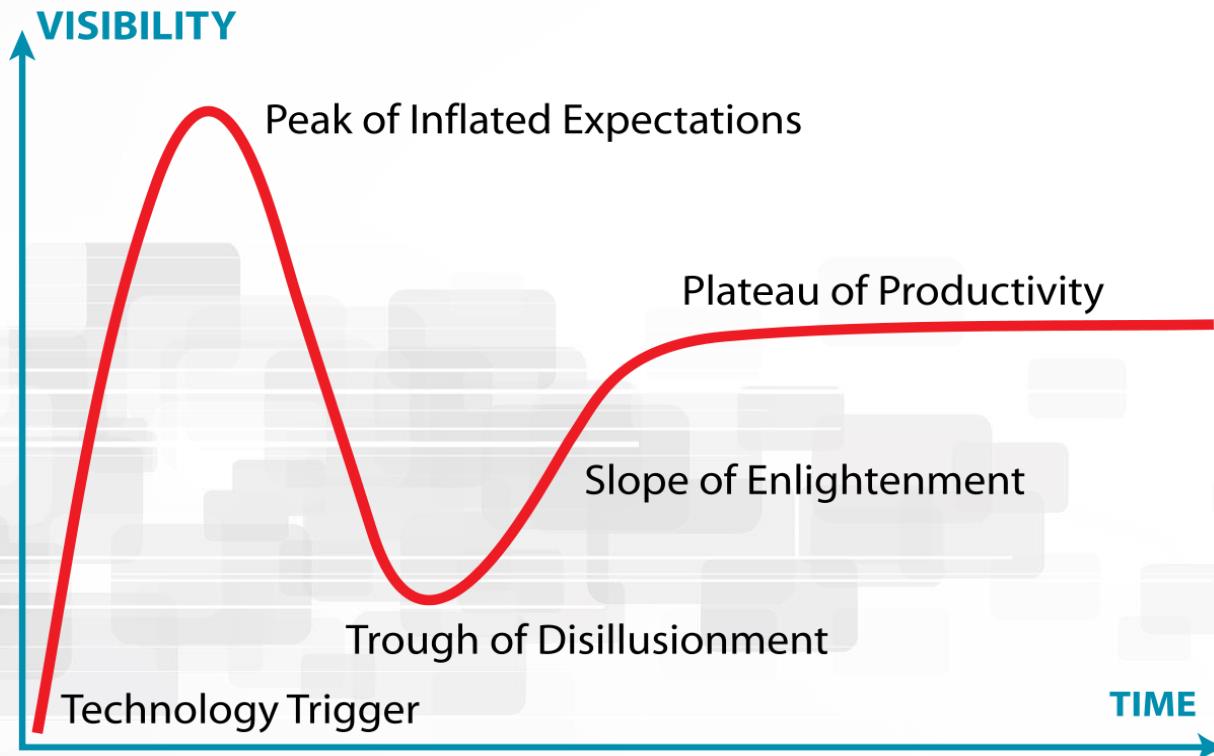
Bas Keijzers

Technical Manager Manufacturing

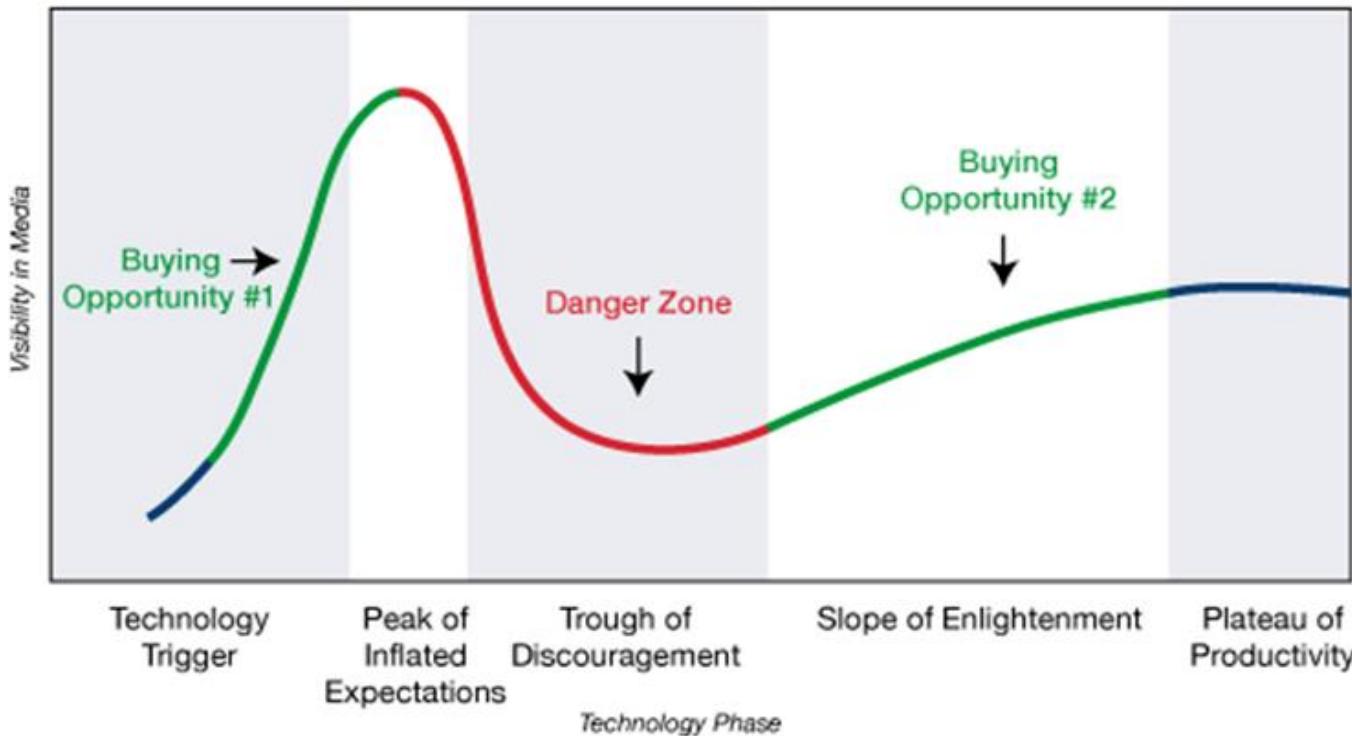
Hype or Reality?



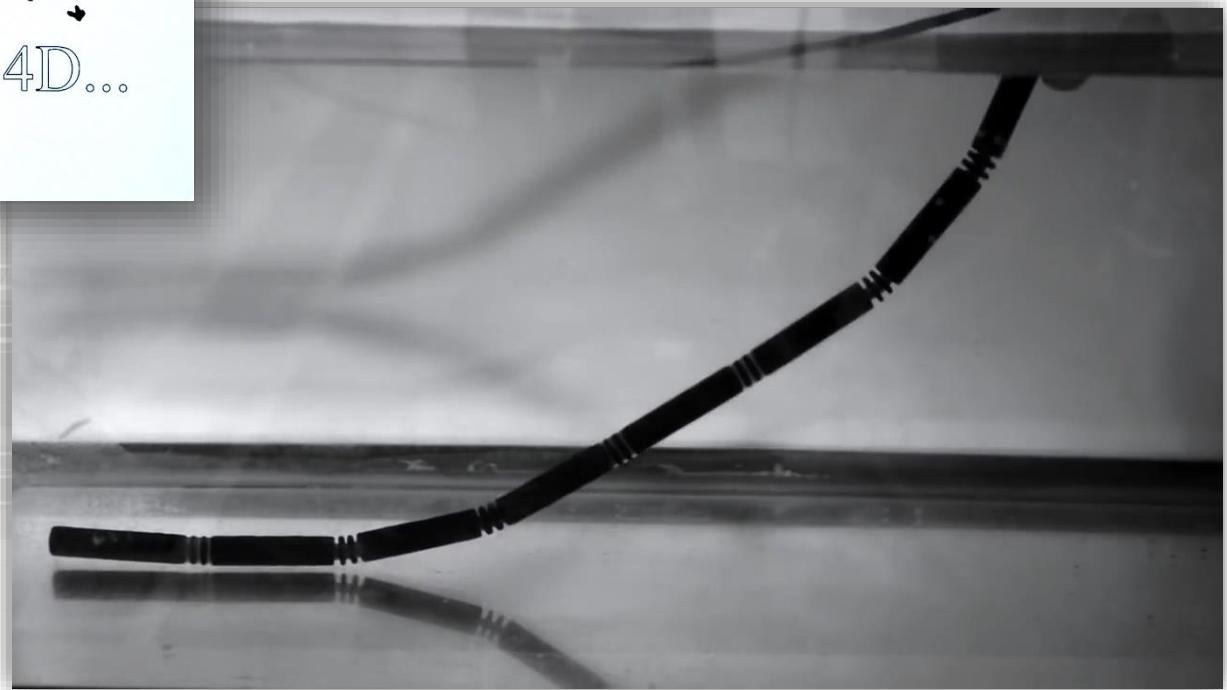
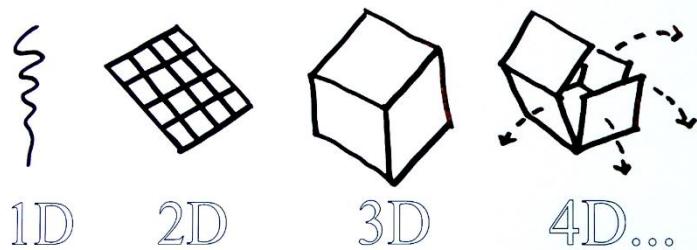
Gartner's hype cycle



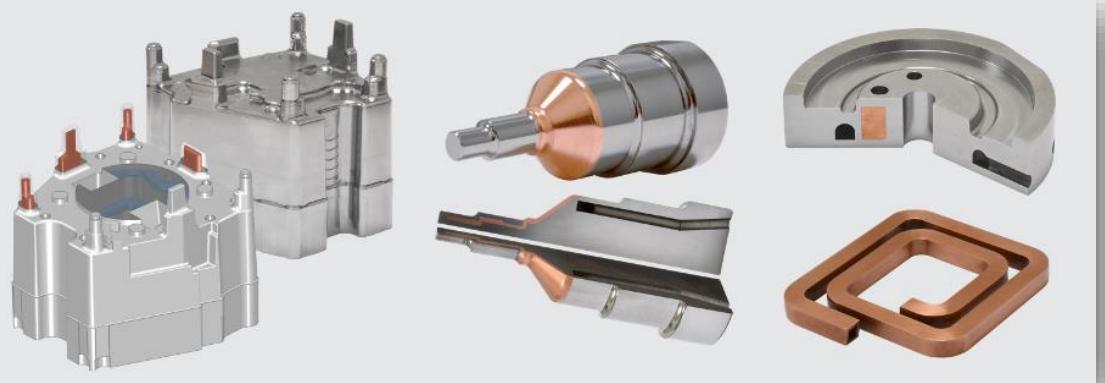
Buy or bye?



4D Printing



MPA Metal Powder Application



Equiaxed grain particle



Super-sonic impact

Substrate

Highly elongated grains at interface



Low-Strained grains

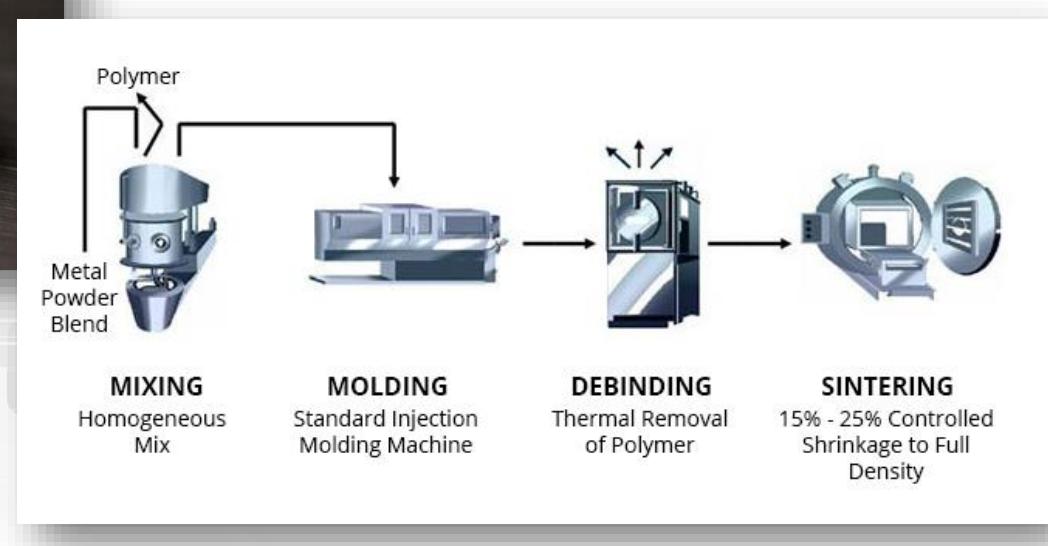
Interfacial heat generation

Elongated interface grains

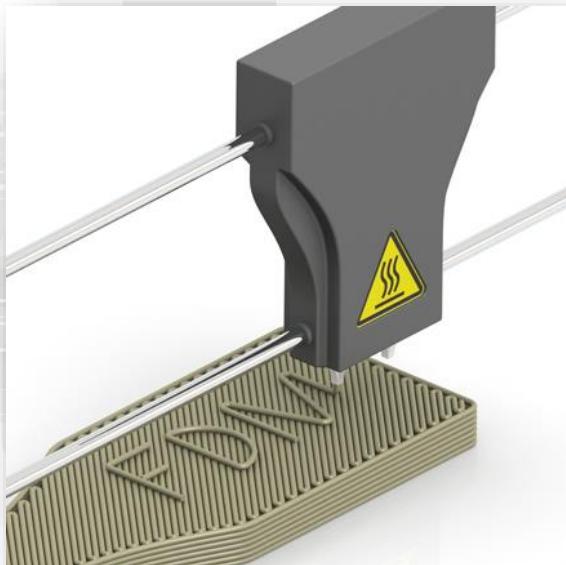
Successive deformation of particle

10 GPa
1000°C

MIM - Metal Injection Molding

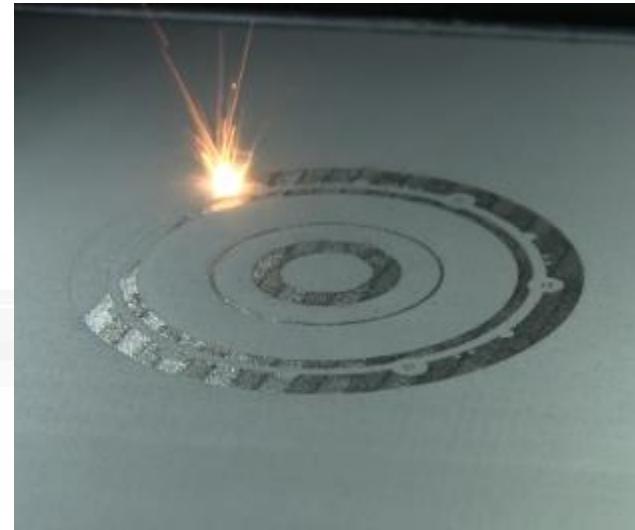


FDM Fused Depostion Modeling



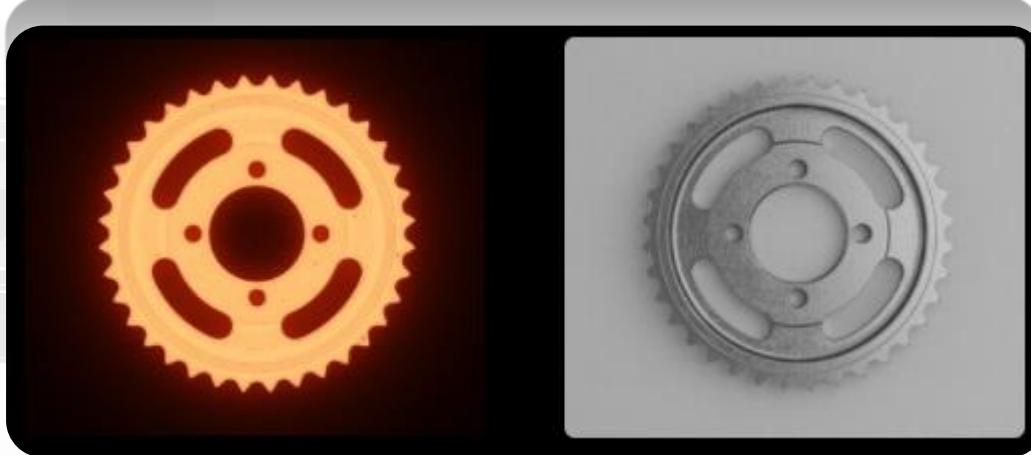
SLA Stereolithography

SLS Selective Laser Sintering

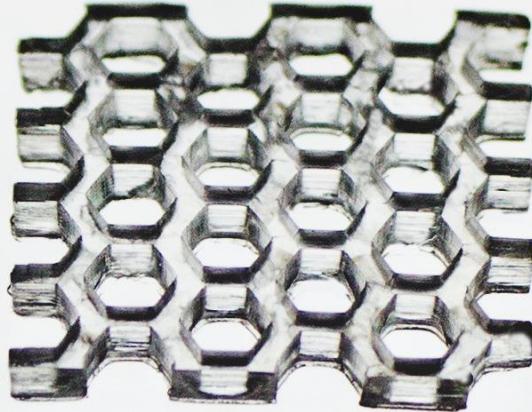


ADAM

Atomic Diffusion Additive Manufacturing



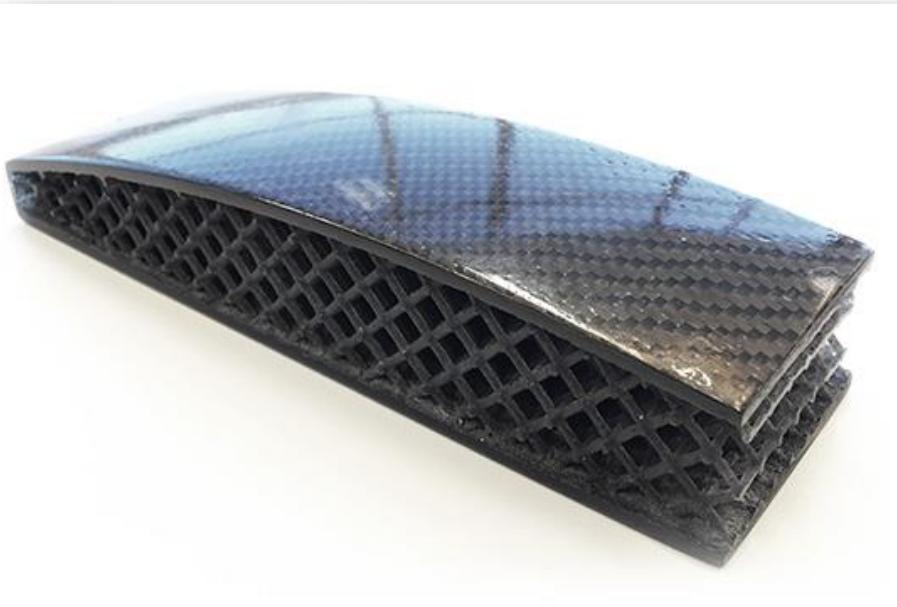
Glass printing



Ceramic printing



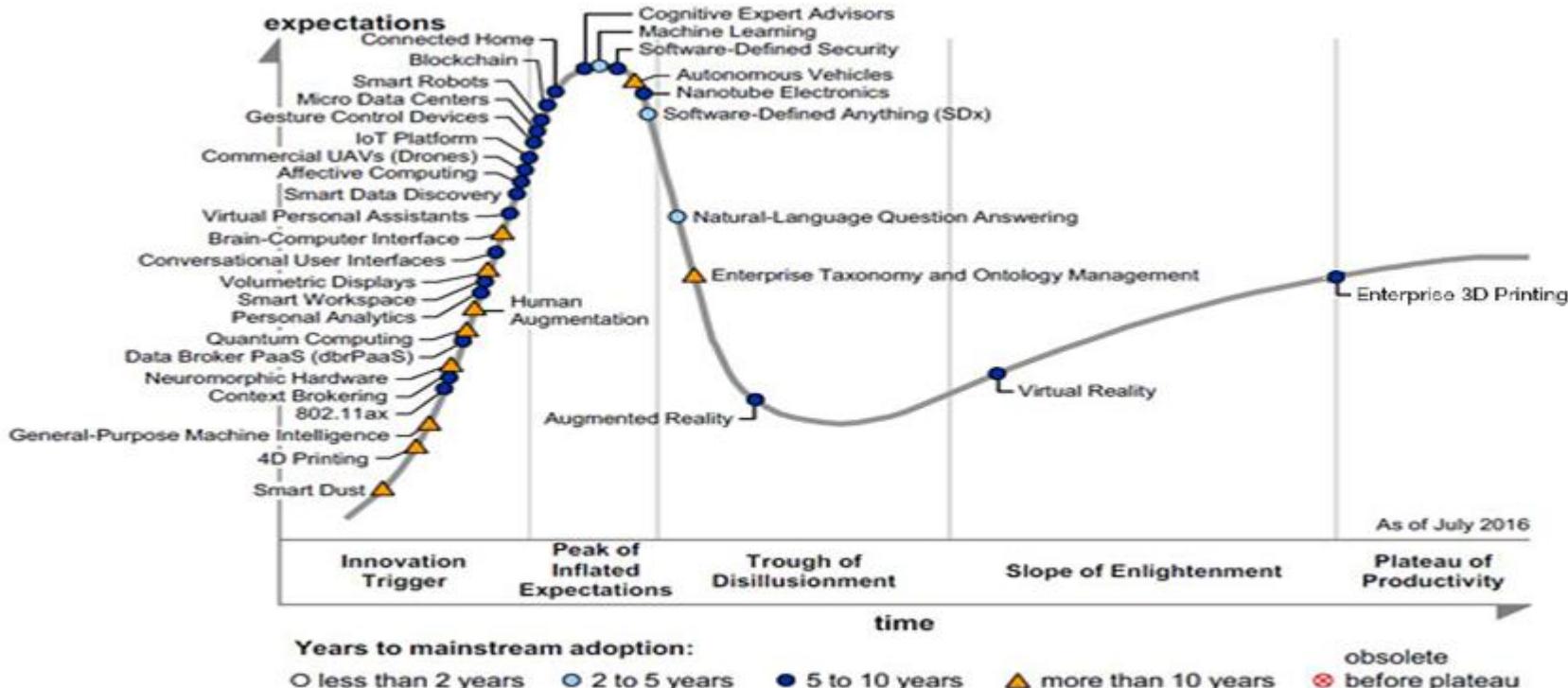
FRP3D



Hybrid Machining



Let's get real



Source: Gartner (July 2016)

FDM printing

3d printer - Google zoek

Veilig | https://www.google.nl/search?q=3d+printer&oq=3d+printer&aqs=chrome..69i57j0i5.2743j0j4&sourceid=chrome&ie=UTF-8#tbs=vw:g,mr:1,pric

3d printer

Alle Afbeeldingen Maps Shopping Meer Instellingen

Tot € 300

Sorteren: Standaard Weergeven: Raster Mijn shoppinglijst (0)

Links van verkopers zijn gesponsord

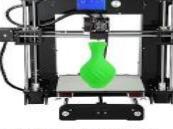
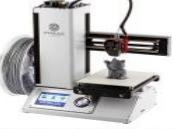
Alle filters wissen

Uw locatie: 's-Hertogenbosch

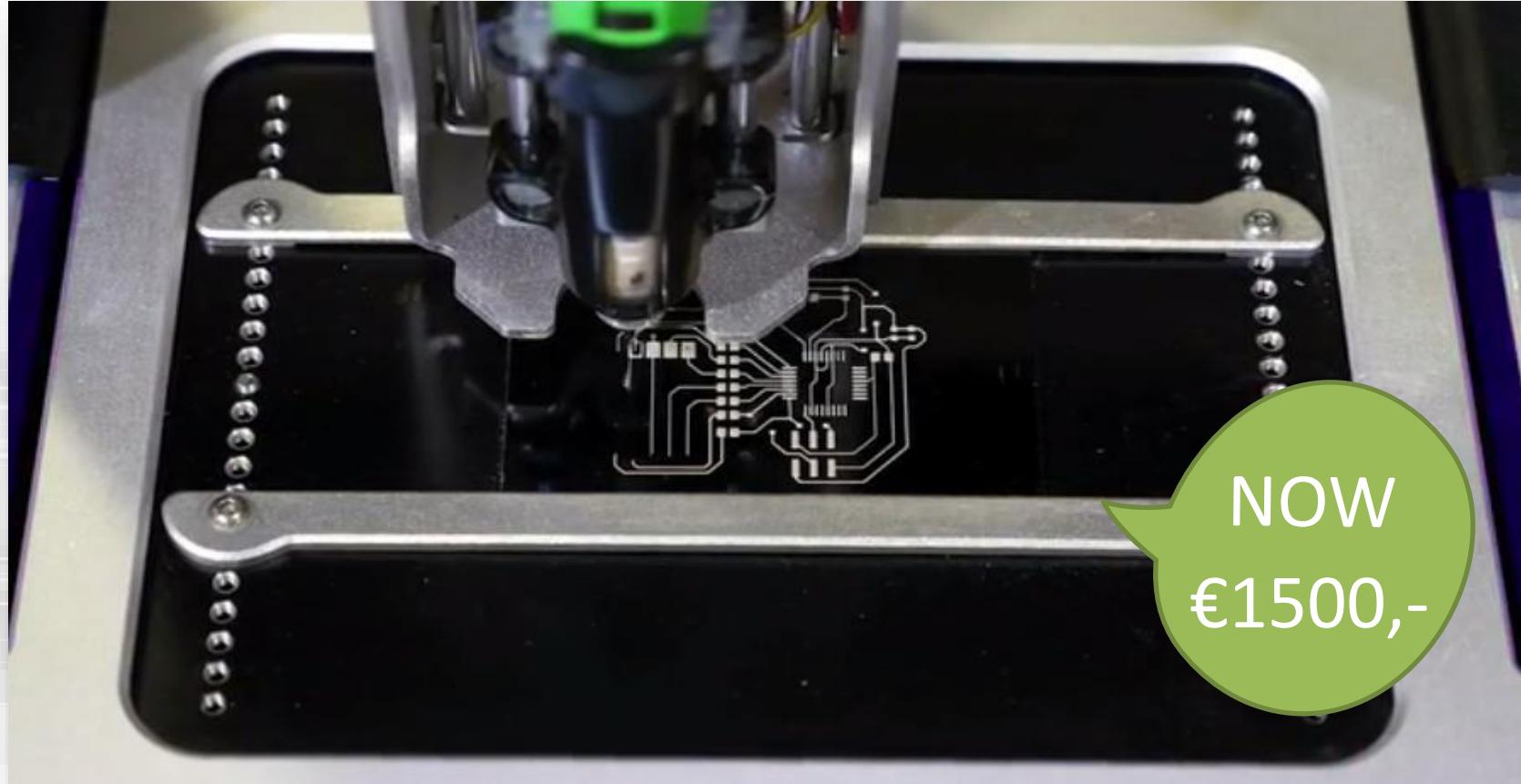
Alleen tonen Nieuwe artikelen

Prijs - Wissen Tot € 300 tot € 300 Zoeken

Verkoper 3DWare bol.com Foto Meijerma Megekko.nl wehkamp Meer

 XYZprinting Da Vinci Mini 3D Printer € 295,00 bij 3D Ninja B.V.	 Drukbed-uitbreiding Velleman K8206 Geschikt voor: Velleman K8200 € 139,00 bij 2 winkels	 da Vinci Mini W € 285,00 bij 4 winkels ★★★★★ (45)	 anet a3 hoge precisie hoge kwaliteit fdm desktop 3D-printer #00001 € 260,05 bij LightInTheBox	 anet a3-b hoge precisie hoge kwaliteit fdm desktop 3D-printer ... € 130,36 bij LightInTheBox	 anet a8 FDM desktop diy 3D-printer #00001 € 130,36 bij LightInTheBox
 anet a6 nieuwe versie fdm desktop diy 3D printer (adjustable ... € 160,04 bij LightInTheBox	 3D-printer diy kit onderwijs Prusa i3 hoge precisie #00002 € 173,04 bij LightInTheBox	 3d printing anet a2-b hoge precisie hoge kwaliteit fdm desktop diy ... € 145,30 bij LightInTheBox	 PrimaCreator P120 Standaard 3D Printer € 299,00 bij 3D Ninja B.V.	 CoLiDo zelfbouw-3D-printer DIY € 294,30 bij 123-3D.nl ★★★★★ (1)	 Flashforge MK10 Dual Extruder Set Standaard 3D Printer € 149,00 bij 3D Ninja B.V.
 da Vinci miniMaker Special Edition Red 3D Printer € 259,00 bij 3DWare	 geeetech mecreator 2 desktop ultrahoge precisie plaatwerk 3D ... € 232,01 bij LightInTheBox	 Geeetech i3b 3d printer usb gravure gebied 200 200 180mm abs pla ... € 163,73 bij LightInTheBox	 DaVinci XY3F1WKEU01F Fused Filament Fabrication (FFF) € 254,90 bij 2 winkels ★★★★★ (45)	 Ultimaker Advanced Printing Kit 2 3D Printer € 107,69 bij 3D Ninja B.V.	 XYZprinting Da Vinci 1.0 Pro - Laser Module 3D Printer € 159,00 bij 3D Ninja B.V.

PCB printing

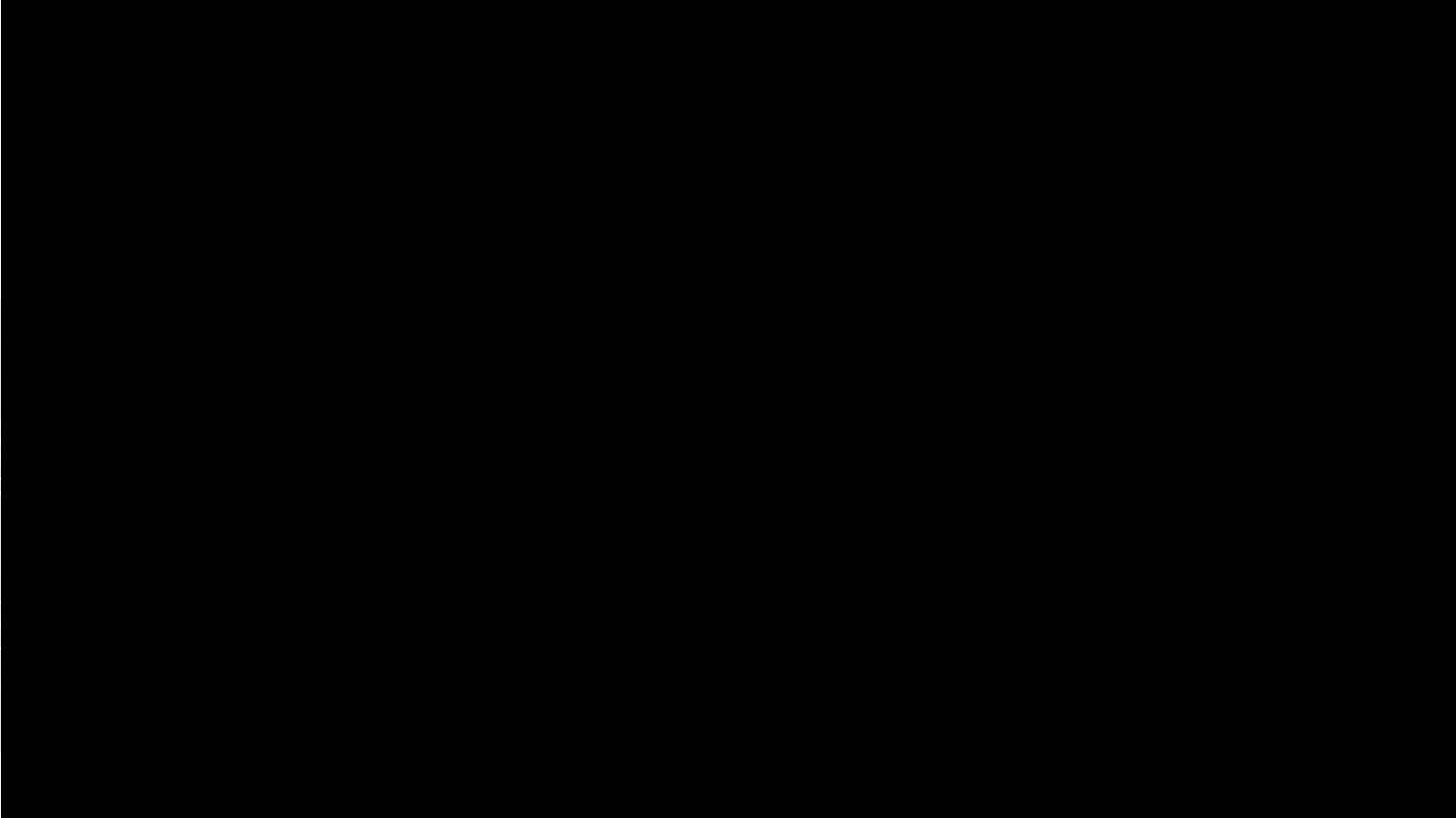


NOW
€1500,-

3D Metal printing



Biomimicry



Biomimicry



Biomimicry



Biomimicry



Biomimicry



<https://asknature.org/>

The screenshot shows the AskNature website homepage with a dark teal background. At the top, there's a navigation bar with a butterfly icon, the text "AskNature - Innovation", and a search bar containing the word "training". Below the search bar is a sub-header "Search powered by algolia". The main headline reads: "Life on earth presents elegant solutions to many of the challenges that designers and innovators face every day. Explore AskNature to find biological strategies, inspired ideas, and resources relative to your own innovation challenges, so you can begin to emulate the time-tested forms, processes, and systems that already thrive in balance with Earth's complex systems." Below this, there are four colored boxes: green for "BIOLOGICAL STRATEGIES", teal for "INSPIRED IDEAS", purple for "RESOURCES", and brown for "COLLECTIONS". Each box contains a small icon and a brief description.

BIOLOGICAL STRATEGIES

Nature's refined solutions, mapped to your design challenges.

INSPIRED IDEAS

Design solutions to human challenges, inspired by biological strategies.

RESOURCES

Everything you need to learn and teach about biomimicry and life centered design.

COLLECTIONS

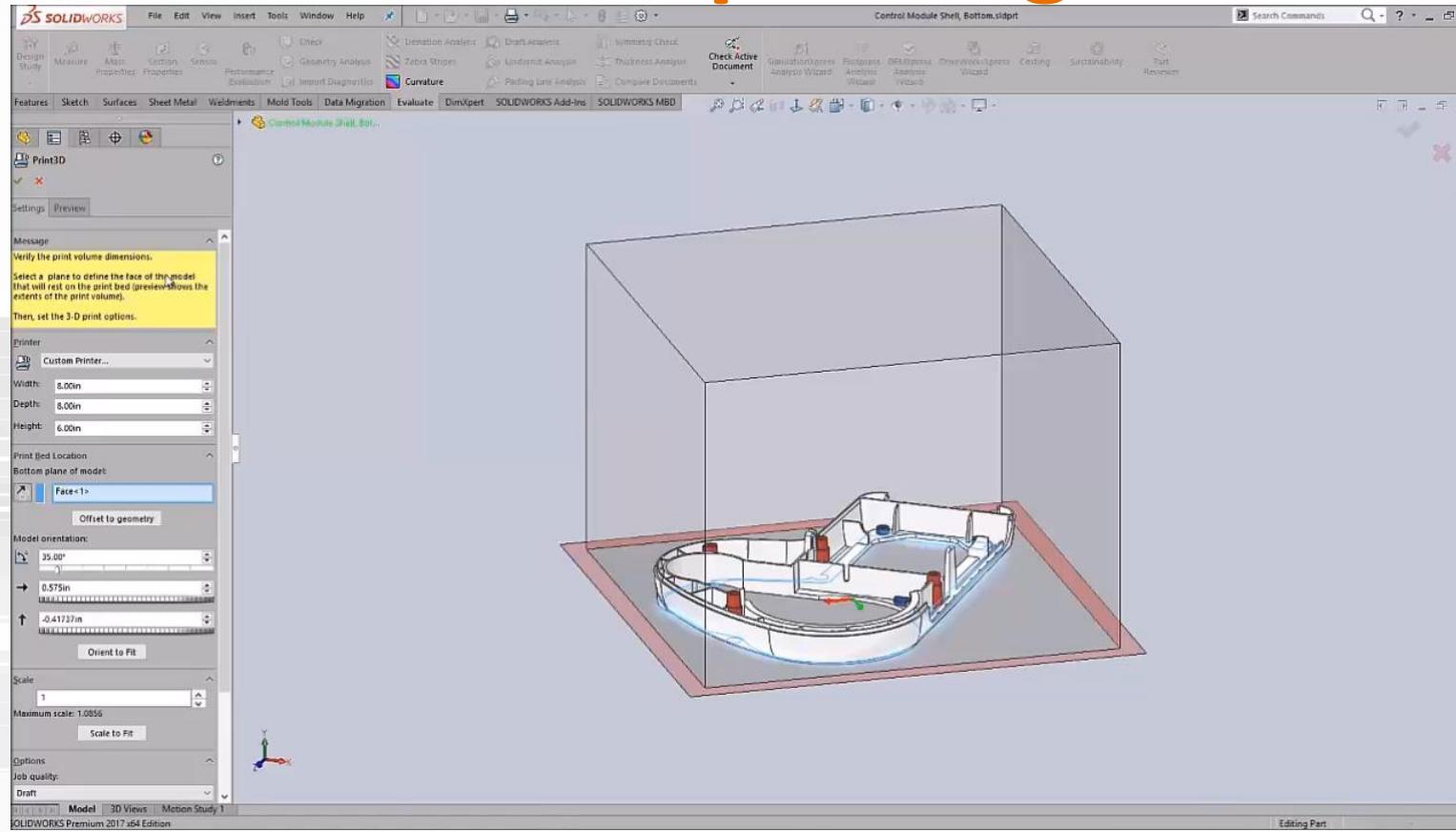
Themed clusters of strategies, ideas, and resources, curated by you.

Morphological analysis

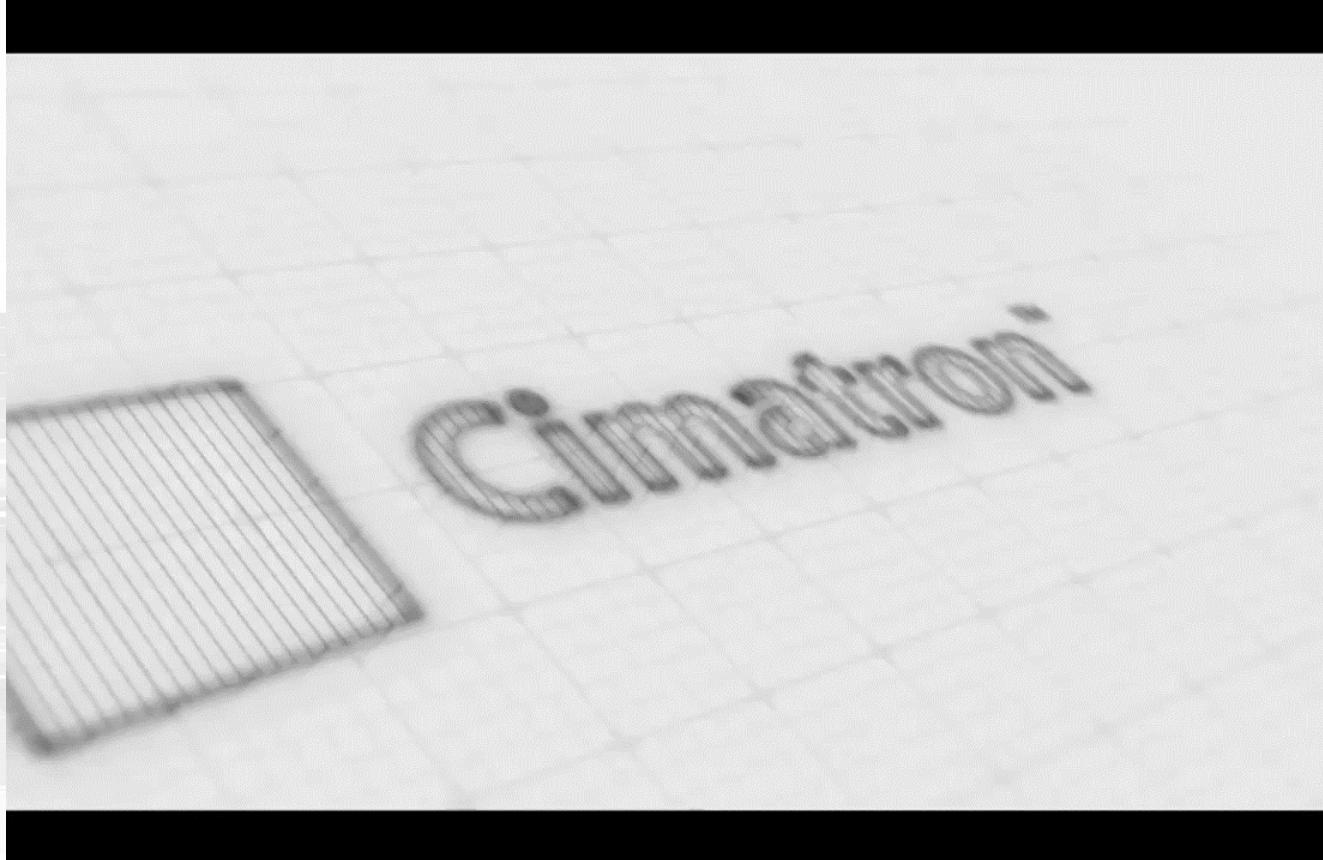
Morphological Chart

	solutions →													
'human power'	liften	1 been opzetten	2 been opzetten	2 armen opzetten	beugelen buigen	buigen buigen	buigen buigen	buigen bewegen	stoppen	stilstaan staan	stoer hangen	schuiven hangen		
steering	steeringwiel	beleden + lukt	begeleidigd waden	Ademhoren	beleiden	skateboard achter	zwenktafel	schommelende	stuurtafel	20%	inhamerende dekken	40%	tank principe	steering links
transmition	differentie	'vermat'	docht	Vooras	veiligheidsgreep	afslag	casovert	vermatel	real traine	afslag	ketting/handvat	2 handvaten	handen op standaard	
surprise	instabiliteit	explosieve voor	verschil snelheid en massa	extra puf!	verschil input en output	kinetische	verschil snelheid en tactiliteit	verende ondervloede	geluid					
learning effect	waardebaarheid van leerstof	balans	Timing	upgrade capaciteit										
acceleration	variable speedometer	variable stridometer	versnelling	$F_z \downarrow$										
'human power' 2	lopen	atlassen/duiken	lopen	lopen	zwaaien	arm zwaaien	duiken	atlassen/duiken	lopen	lopen	schouderwippen	opslagen	schoppen	
steering 2	standaardwippen	skateboard schuif	skateboard	schommel achter	schommel veld	2 voetwielers	rotatoren	verende zitkussen	zwaai-skateboardwippen	veeggeveegd staan	ontwijken normaal	ontwijken kieptafel	ontwijken hielafslag	

SolidWorks 3D printing



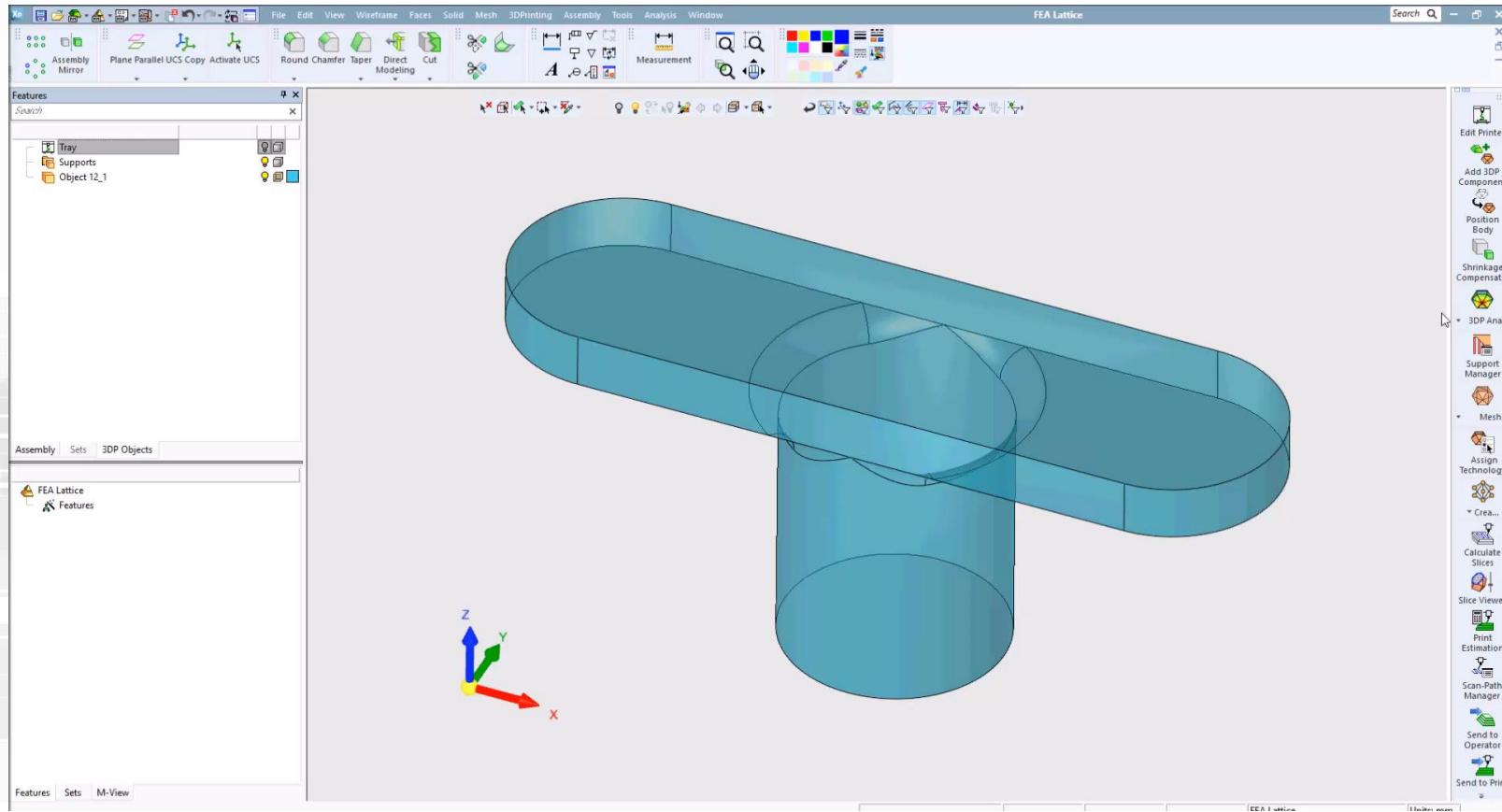
Conformal cooling



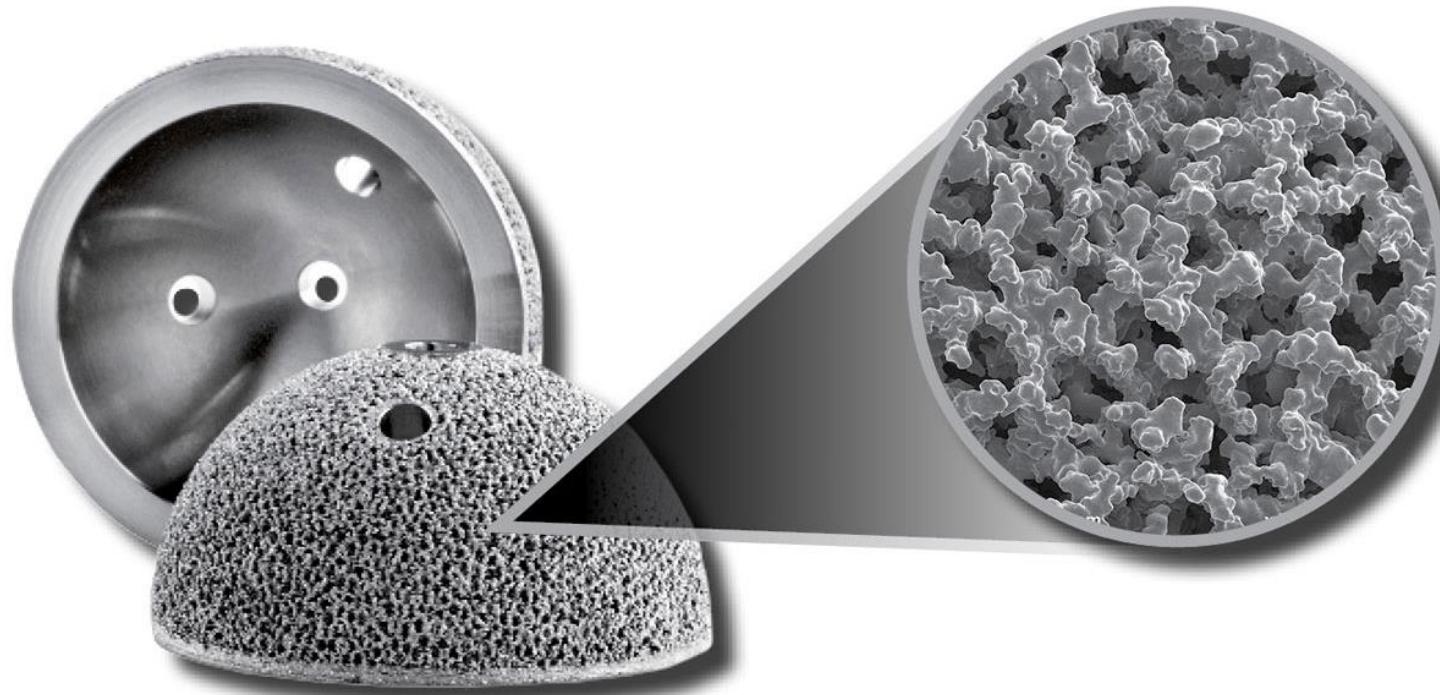
Lattice infill



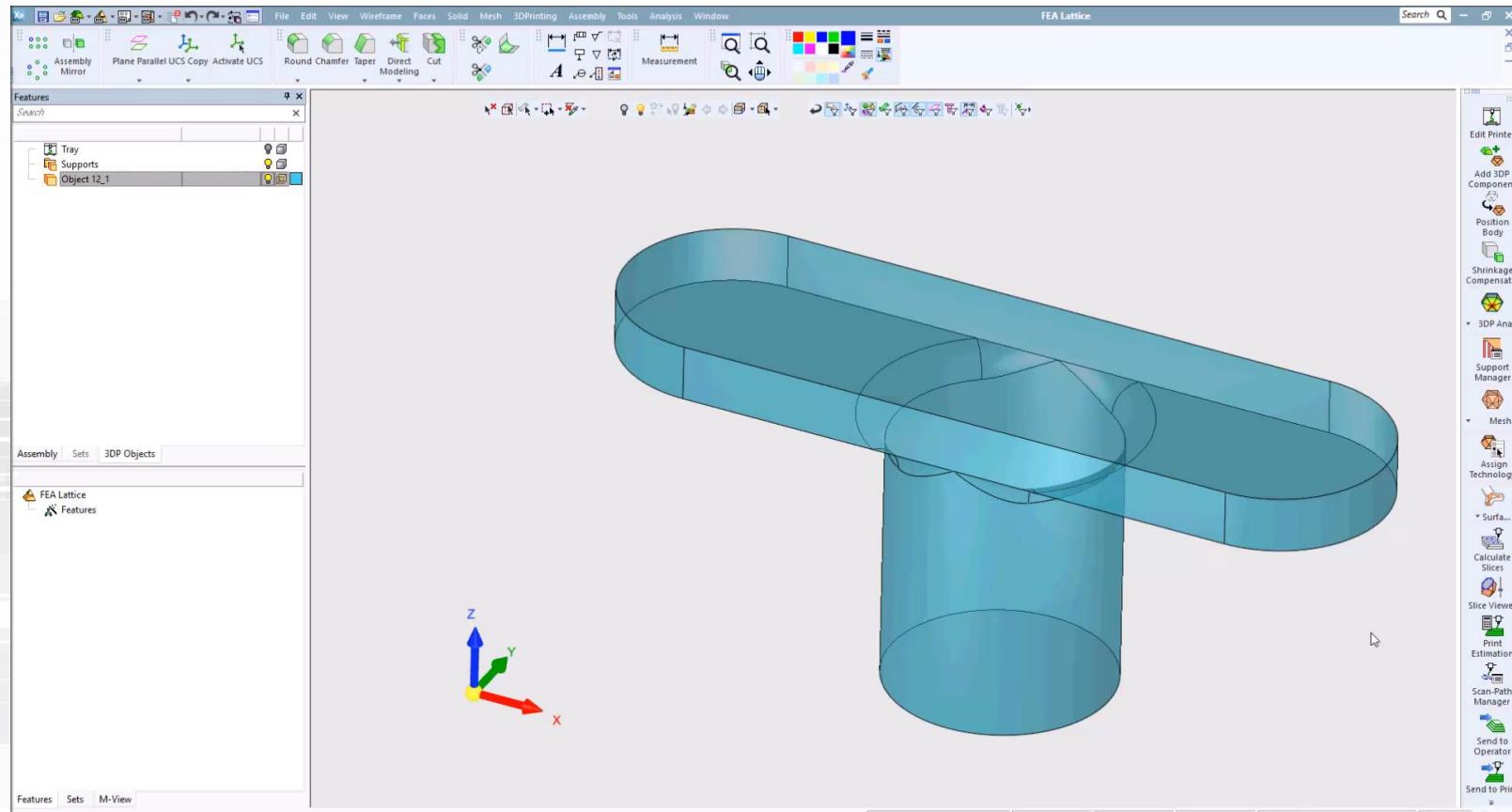
Lattice infill



Surface lattice



Surface lattice



Topology optimization







Thank you!

