

EXPLORATION OF COLLABORATION BETWEEN NATURE AND TECHNOLOGY :

[a thread of interdisciplinary collaboration and design innovation running through 3rd year]

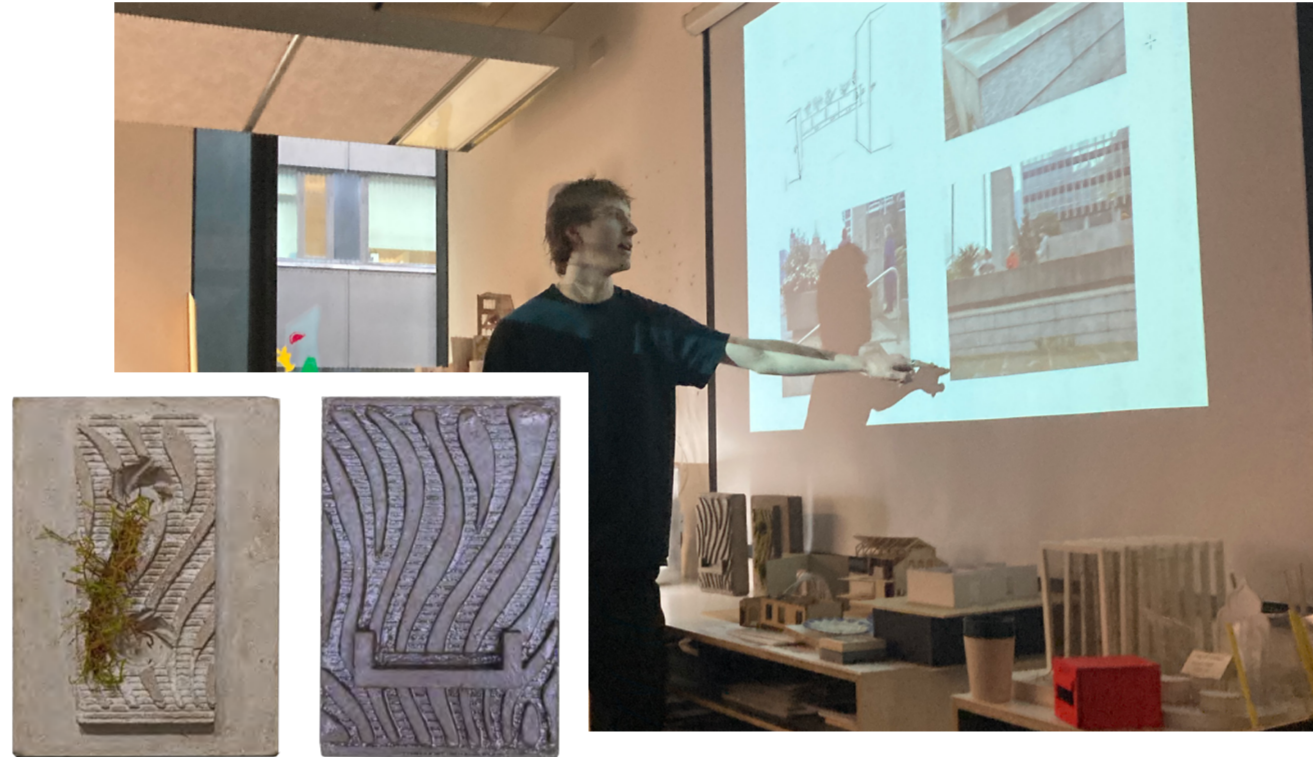
Dissertation: DOES THE INTEGRATION OF TECHNOLOGY AND BIOMORPHIC FORMS OFFER A VIABLE SOLUTION TO OPTIMISED STRUCTURES OF THE FUTURE?

I researched into how computer science, biology and architecture can collaborate to create lightweight optimised forms in the name of material efficiency.



Biodesign Skillsharing Workshop:

I was invited to host a workshop with second year design students across different disciplines, encouraging them to use digital and making tools to design not just for the humans in their space, with the aim to create regenerative design.



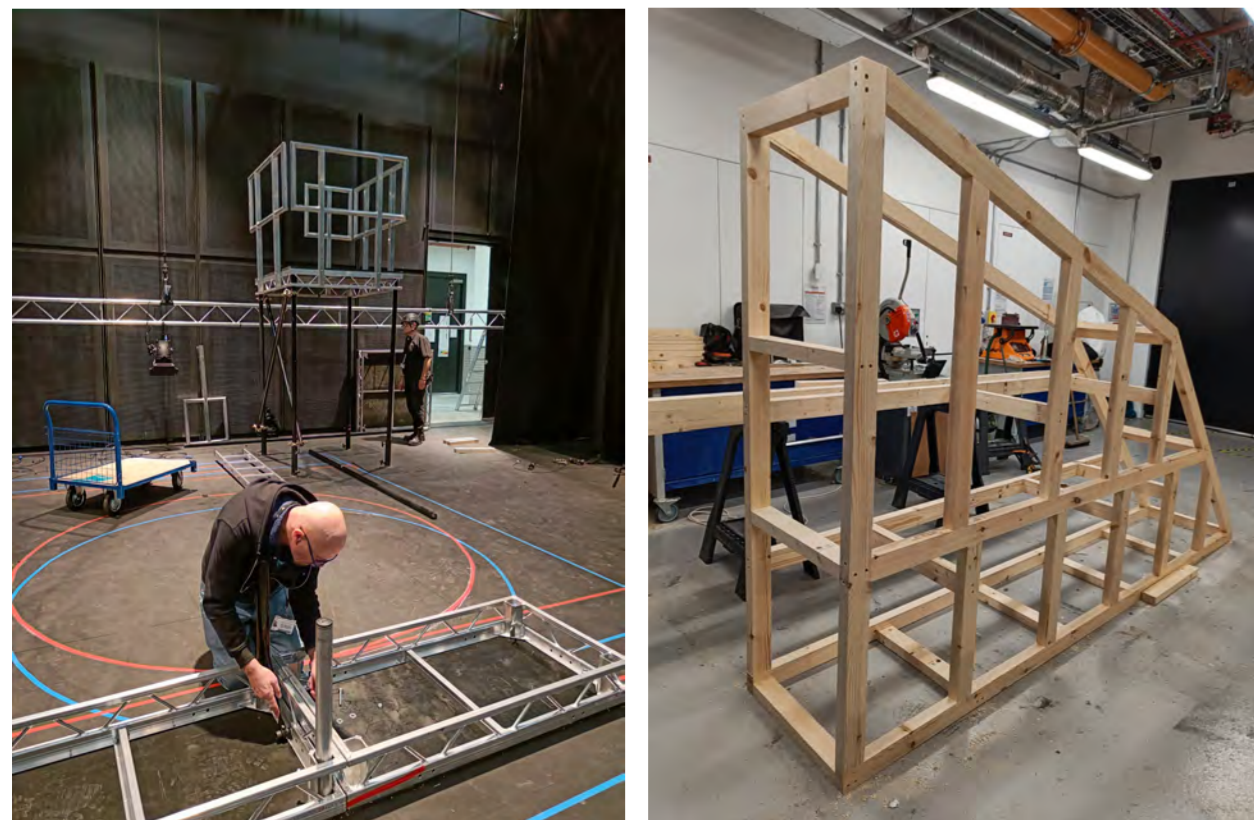
Mycelium experiments:

Inspired by my dissertation, after Christmas I spent regular time working in the MMU life sciences department. Working with Paul Benson-White on a self-lead research project experimenting making biomaterials out of oyster mushroom mycelium. This work was woven into my final project and aims to show that if more interdisciplinary collaboration is encouraged then the waste from the workshops can be used to create regenerative forms and food sources.



Theatre and live performance workshop:

Since September I have worked 1 on 1 with Chris Snape in Manchester School of Theatre, building sets and props for third year acting students. This has informed my projects through hands-on making experience and observing how the lack of communication between disciplines leads to avoidable material waste.



SPECULATIVE SPACE : Church of Solarpunk

Final major project: a space situated in an existing church. The space is designed using parametric design, biomaterials and biomorphic forms. The concept is a open-source learning & maker space, with labs, workshops and growing spaces. Informed through collaboration across different workshops/labs, the space's schedule of accommodation aims to encourage the protagonists to observe and mimic nature's model - one room's output is another's input.



RECYCLED AGGREGATE CONCRETE 3D PRINTING:

I competed for funding and exhibition space for the Manchester School of Art Vertical Gallery. The funding was used to pay for the wages of Nick Hurst and 2 masters students to be trained as concrete 3D printing technicians to collaborate on the project.



[CHURCH OF
SOLARPUNK]

Can the collaboration between humans, algorithms and organisms create regenerative architecture to reduce the human impact on the living world.

How can we use nature's model to repurpose waste into regenerative spaces?

A live speculative project aiming to illustrate real-world applications of a speculative science fiction genre and online community, solarpunk.

Solarpunk is an online community that envisions and works toward actualizing a sustainable future interconnected with nature and community. I set myself the aim of investigating whether interdisciplinary collaboration is the answer to creating a solarpunk future.

This is actioned through showcasing the synergetic potential for sustainable design when 3 disciplines come together - design, biology and digital engineering - aiming to encourage more future interdisciplinary education in the name of sustainability.

The project is two fold:

1- A speculative interior that envisions a community space designed to action the aims of solarpunk by bringing the ideas off the keyboard into a physical space.

2- A live making project in which I put myself in the protagonist's shoes, through collaborating with specialist from different departments across Manchester Metropolitan University create regenerative forms from waste on a local and global scale. Investigating two forms of design innovation:

Myco-remediation :

[using organisms to breakdown human waste, absorb CO₂ and create new interior objects]

RFA Concrete 3D printing ;

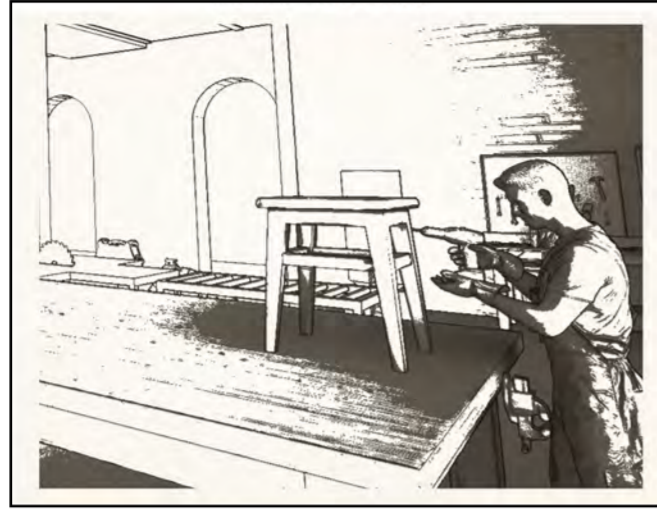
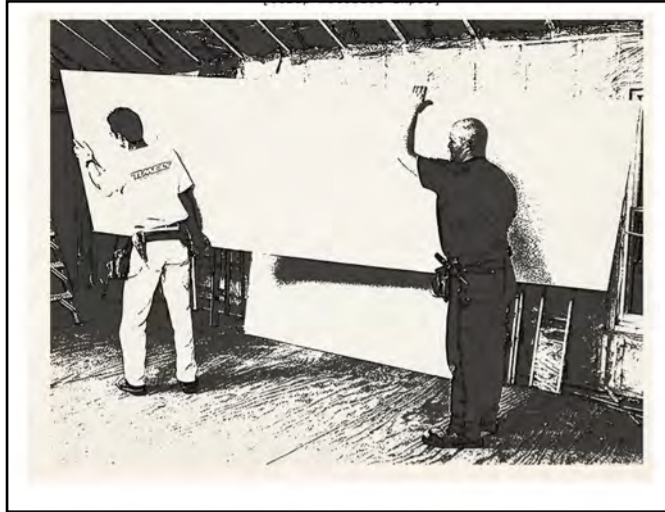
[3D printing forms out of architectural demolition waste]



MYCELIUM + 3D PRINTING: [waste doesn't exist in nature]

[Scrap material input]

[Regenerative ornamentation output]



[Scrap material enters space]

[Make new forms]

[Collect sawdust]

[Sterilise Sawdust]

[Innoculate substrate with Mycelium]

[Grow form in reusable 3D printed mold]

[Collaboration With Chris Snape]
[Manchester School of Theatre]

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[Manchester School of Theatre]

[Collaboration With Paul Benson-White]
[Micro-biology department]

[Collaborate with Organism]

[Micro-biology department]

[Mycelium starts to eat its own 3D printed mold]



[Grown within clear PLA, a biopolymer made of cornstarch]



CLICK ME FOR MYCELIUM GROWING PROCESS VIDEO!

[Final Mycelium candle holder sample - 1/5]



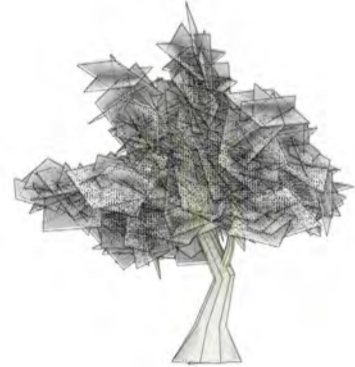
[USING ORGANISM TO BREAKDOWN HUMAN WASTE, PRODUCE FOOD AND ABSORB CO2]

[MAN'S DETACHMENT FROM NATURE]

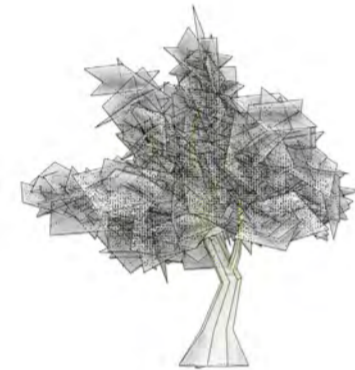
// anthropogenic mass [human mass] > biomass [living mass]



[2040]
predicted that the anthropogenic mass will triple biomass



[2020]
cross over year anthropogenic mass outweighed all world biomass

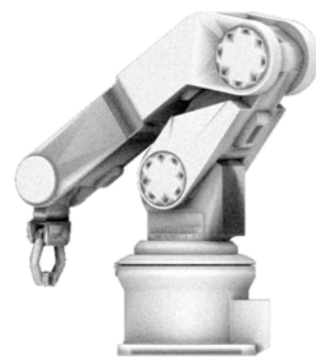
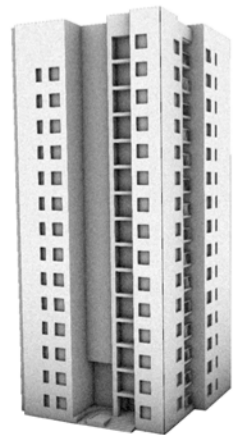


// 1900
anthropogenic mass was 3% of biomass



QUESTION . . .

how can we use technology to re-use our redundant buildings to reduce the human mass and leverage our relationship with the natural world?



Construction, demolition & excavation generated around three fifths [62%] of total UK waste in 2018. 3D-printing has the ability to create forms additively and precisely, leading to near-to-no waste. Can 3D printing construction waste into architectural forms be a sustainable future of construction?

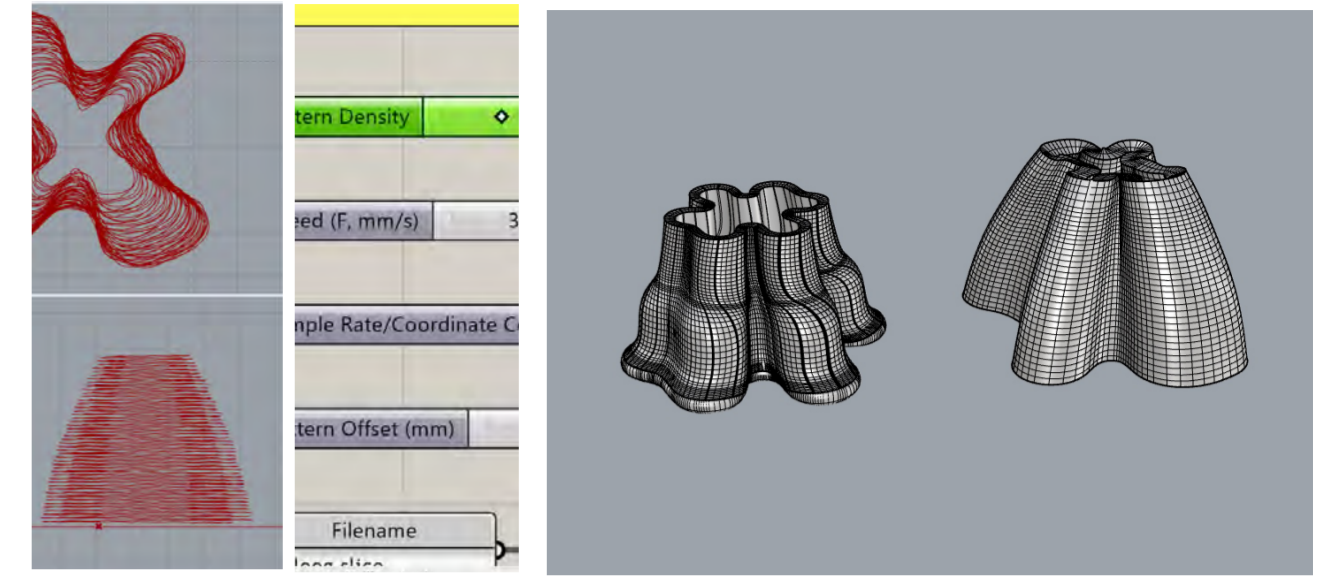


CLICK ME FOR CONCRETE PRINTING PROCESS VIDEO!



1 - Digital Form-Finding

[collaboration between designer and algorithm]



To design the concrete forms, I wrote a parametric script on Grasshopper to create biomorphic forms. The collaboration begins once the algorithm is created, changing each parameter generated a different organic variation, leaving the designer to choose and manipulate the the favourite forms.

2 - Recycled Concrete Mix

[Collaboration with Engineering Department]

[Nick Hurst, Hector Smets, Sam Hitchen]



[sieve the demolition debris]



[finer sand goes in the concrete]



[larger pebbles used for infill]



[test moisture level of the sand]



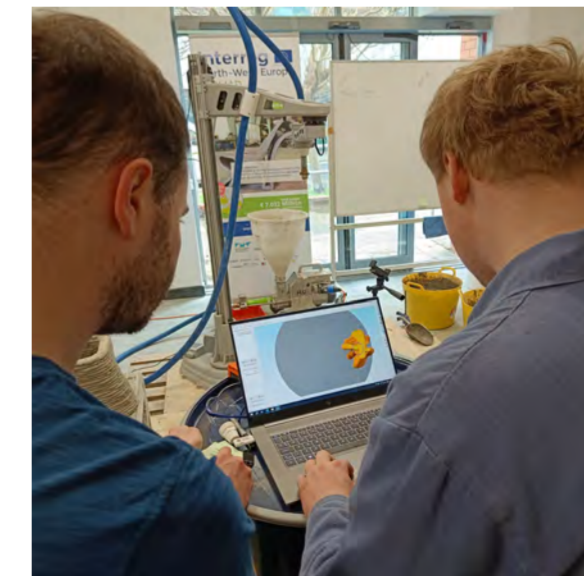
[dry mix - lime + cement + water]



[wet mix - add water - print ready]

2 - 3D Printing RFA Concrete

[collaboration between robot and humans]



Nick Hurst and I developed a never-used-before technique to get sharp internal overhangs on the concrete forms. I shovelled the larger demolition waste pebbles inside the form whilst it's printing, acting as support material for the wet concrete. Once I had sliced by 3D model into a printable G-code file, the two postgraduate researchers funded by Kate Egan set up the robot arm for the 3D print. The wet concrete mix is manually shovelled into the hopper, feeding it into the printer.

FINAL 3D PRINTED RFA CONCRETE PLANTERS BEING PREPARED FOR MMU VERTICAL GALLERY 2024
[After exhibition to be installed in public spaces in Manchester]

