

GECKSKIN™

“THINK LIKE
GECKSKIN”

Repeated attach and release

This is a valuable phrase

OLDER SOLUTIONS WERE:

Destructive

Sticky

Loud

Bulky



NEWER SOLUTIONS ARE:

Able to
attach
and
release
repeatedly



BUT THEY ARE ALSO:

Pre-
designed
materials
(that work
or don't work
for a given
application)

Imagine a product

That can attach and release repeatedly

Designed for your application

This is a *Phelsuma* gecko

“Gold Day Gecko” – *Phelsuma laticauda*, The genus *Phelsuma* was first described by the British zoologist John Edward Gray in 1825 and named after the Dutch physician Murk van Phelsum



**Phelsuma is the genus for these beautiful geckos;
the animal that inspired this technology**

A Gecko (the largest animal to be able to climb a **smooth** wall)

- * Does not secrete a glue
- * Does not require more energy to release (than attach)
- * Has an anatomy that supports this ability

**Geckskin™ will change how
people think about attaching and
releasing**

**It's not the chemistry
It's the structure**

CUSTOMIZED & REUSED!



Shedding the baggage

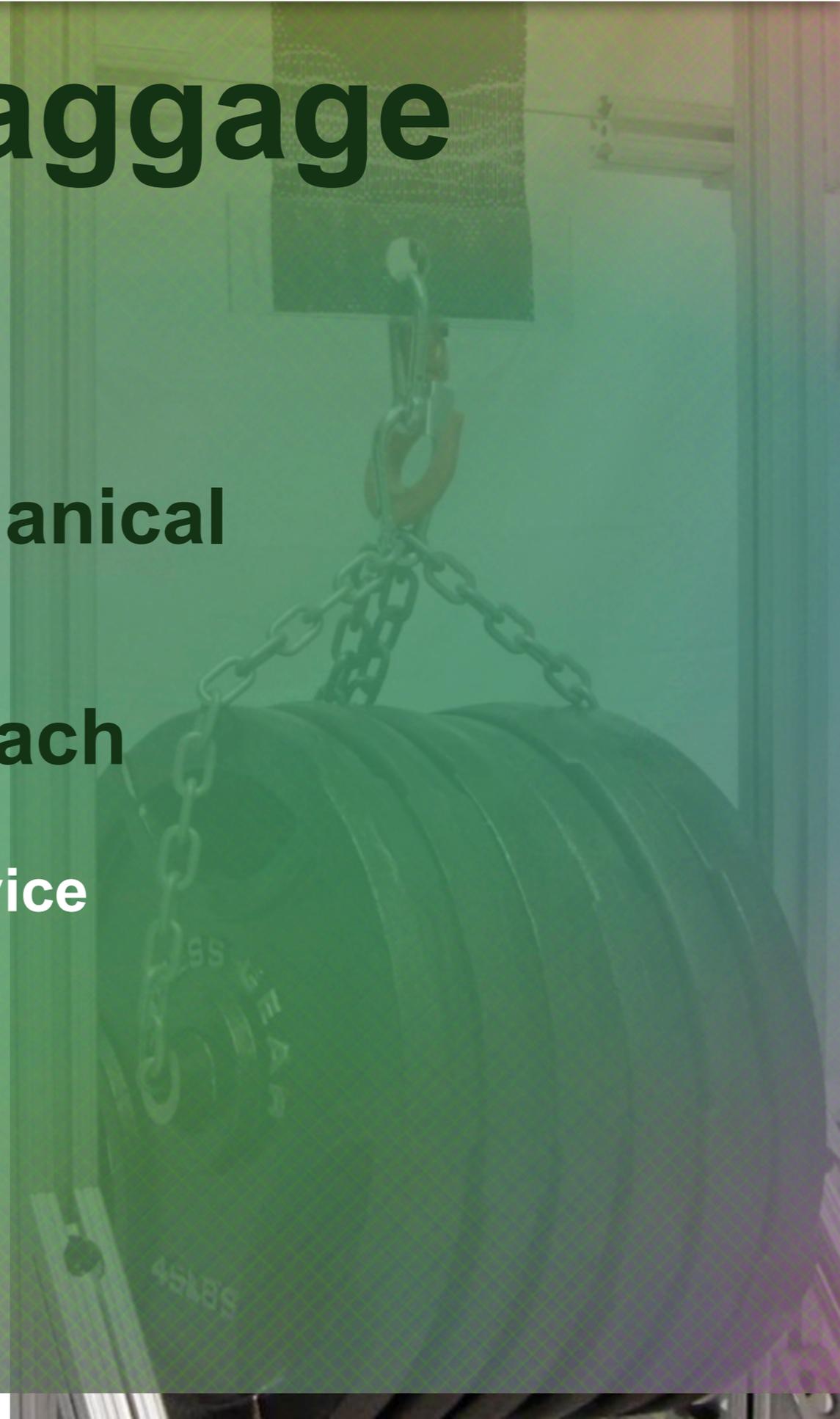
Bond is important

But it's not everything

Approach this from a mechanical perspective

Consider a systemic approach

And the solution becomes a device



CONSIDER SOME MATHEMATICS...

Assume:

- * **Equilibrium: Forces balance**
- * **Unstable failure when maximum load is achieved: design around a point of instability**
- * **Systems that want stored energy to be recoverable: energy in = energy out**

...AND SOME BIOLOGY...

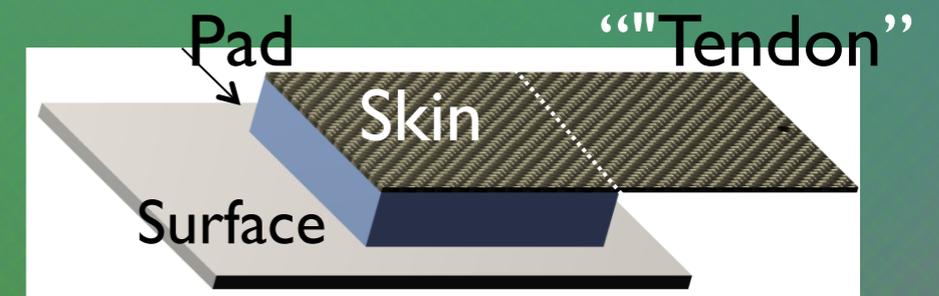
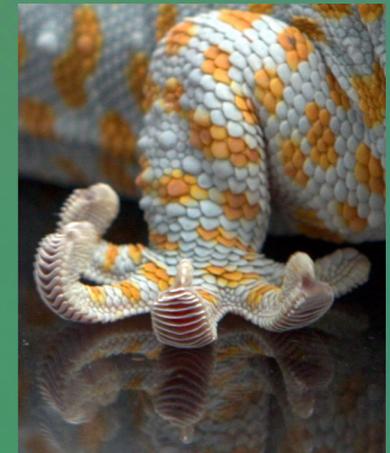
- * **A gecko's foot drapes the surface**
- * **Stiff, thin tendon connects skin to bone directly**

THE ASSUMPTIONS GIVE
RISE TO THE FOLLOWING
EQUATION

$$F_C = \sqrt{G_C} \sqrt{\frac{A}{C}}$$

$$\text{Force Capacity} = \left[\text{van der Waals} \right] \left[\frac{\text{Area}}{\text{Compliance}} \right]$$

STUDYING THE GECKO
REVEALS AN ANATOMICAL
STRUCTURE



The relationship defines Geckskin

Pad



Skin

Tendon

A & C are the Geckskin control panel

Felsuma can adjust multiple variables physically...

Customers define the specifications...

$$F_C = \sqrt{G_C} \sqrt{\frac{A}{C}}$$

A = Area
C = Compliance

- Pad thickness
- Skin thickness
- Skin length
- Skin stiffness
- Tendon stiffness
- Tendon position

- Effective surfaces
- Peel force
- Peel direction
- System dynamics
- Load capacity
- Environmental conditions

...that are explained mathematically

Geckskin is a device that uses mathematics and materials to achieve the desired performance

Long list of available elastomers and materials, each with specific properties

Foundational mathematics are the basis of Geckskin

MENU OF ELASTOMERS

1. Silicone #1
2. Silicone #2
3. Polyurethane #1
4. Polyurethane #2
5. Acrylic #1
6. Acrylic #2



$$F_C = \sqrt{G_C} \sqrt{\frac{A}{C}}$$



Device that performs as desired

- Effective surfaces
- Peel force
- Peel direction
- System dynamics
- Load capacity
- Environmental conditions

MENU OF TEXTILES

1. Glass Fiber
2. Carbon Fiber
3. Nylon
4. Cotton

Three dimensional functionality

Tunable force capacity

Multiple surfaces: glass, metal, drywall, wood

Non-marking and non-tacky

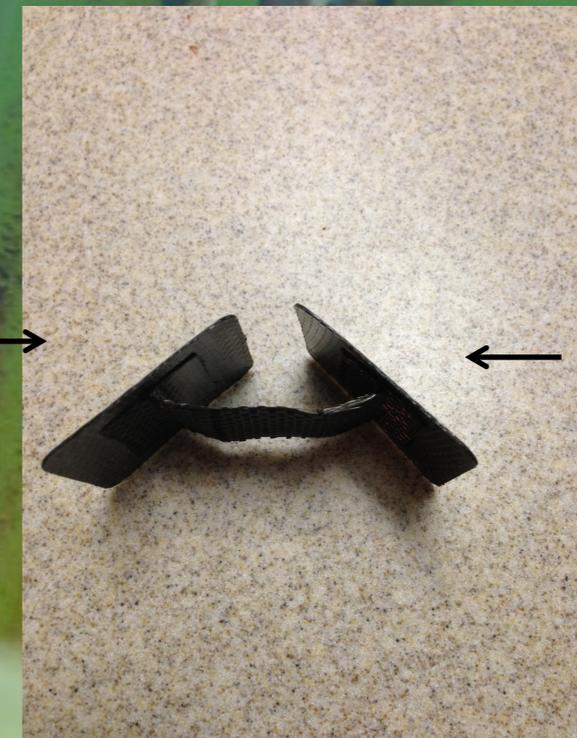
Uses off-the-shelf materials

Uses existing manufacturing processes

Can be washed to replenish capability

Scale-able for larger weights

→
Pad



←
Pad

So, back to basics

We have a device, with an anatomy

We take a systemic approach to your application

We determine:

- * Elastomer(s)**
- * Fabric(s)**
- * Design (with you)**

And distribute weight across the entire device

To create the user experience you require

THINK LIKE GECKSKIN!

ASK NOT “DOES IT...?”

RATHER

ASK “CAN YOU DESIGN IT TO...?”

FELSUMA IS A PARTNER (NOT A VENDOR)

BRANDED COMPONENT MAKER

BUSINESS MODEL:

- CORPORATE PARTNERS' SPECIFICATIONS AND FUNDING**
- FELSUMA IN-HOUSE PROTOTYPING**
- OUTSOURCED MANUFACTURING**
- SHIP SHEETS, ROLLS, STRIPS TO CUSTOMERS**

Multiple publications behind the technology

Bartlett MD, Croll AB, King DR, Paret BM, Irschick DJ, Crosby AJ. (2012) Looking Beyond Fibrillar Features to Scale Gecko-Like Adhesion. *Advanced Materials*. 24:1078-1083

Bartlett MD, Croll AB, Crosby AJ. (2012) Designing Bio-Inspired Adhesives for Shear Loading: From Simple Structures to Complex Patterns. *Advanced Functional Materials*. 22:4985-4992

Bartlett MD, Crosby AJ. (2013) Scaling Normal Adhesion Force Capacity with a Generalized Parameter. *Langmuir*. DOI: 10.1021/la4013526.

Bartlett MD, Crosby AJ. (2014) High Capacity, Easy Release Adhesives From Renewable Materials. *Advanced Materials*. DOI: 10.1002/adma.201305593

King DR, Bartlett MD, Gilman CA, Irschick DJ, Crosby AJ. (2014) Creating Gecko-Like Adhesives for "Real World" Surfaces. *Advanced Materials*. DOI: 10.1002/adma.201306259

FOUNDING TEAM

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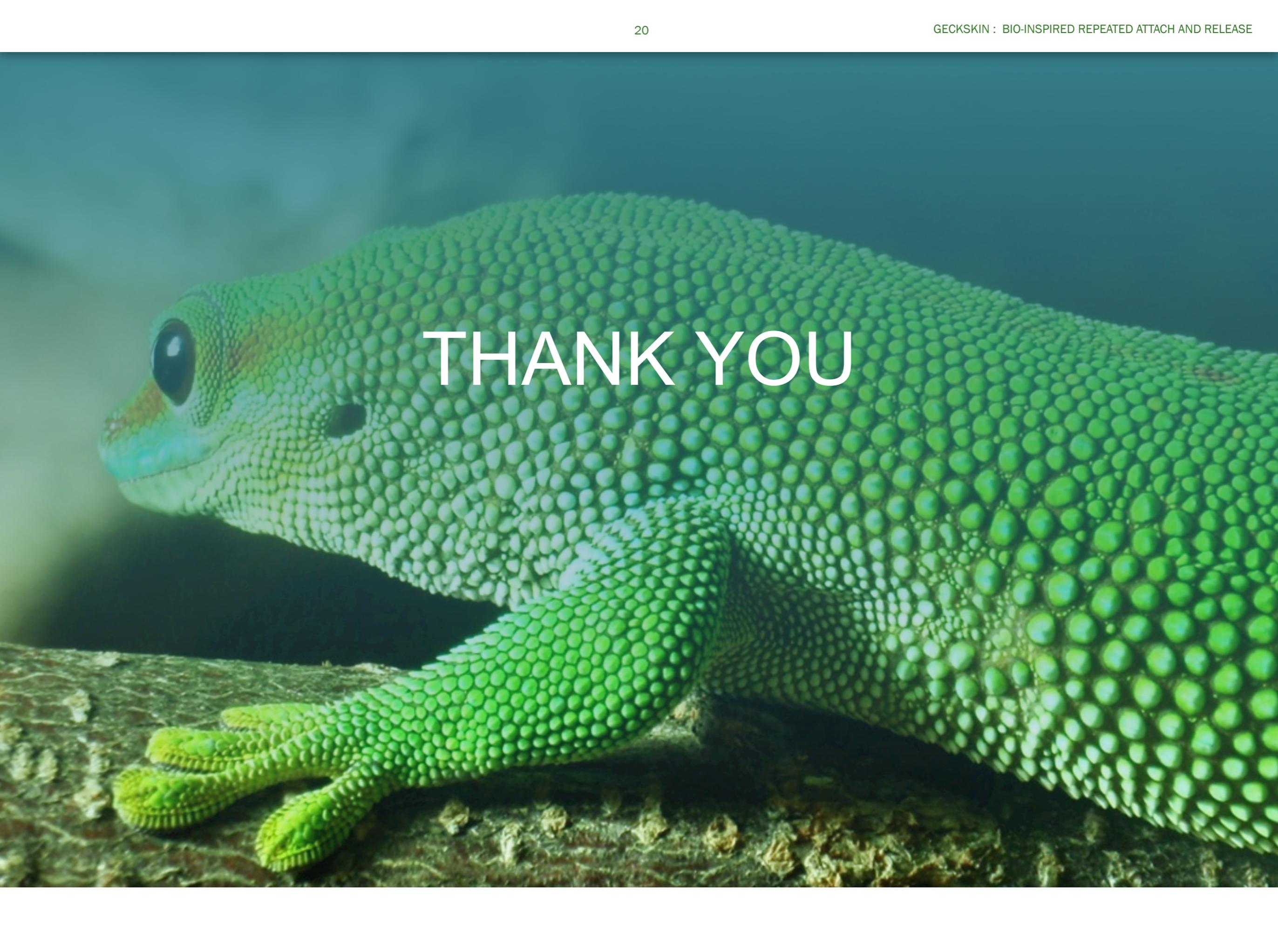
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THANK YOU

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