

EVOLVING ANALYTICAL LAB WITHIN AN INK COMPANY

Natasha Hausler Banke, PhD

Director, R&D Analytical

INX International Ink Company



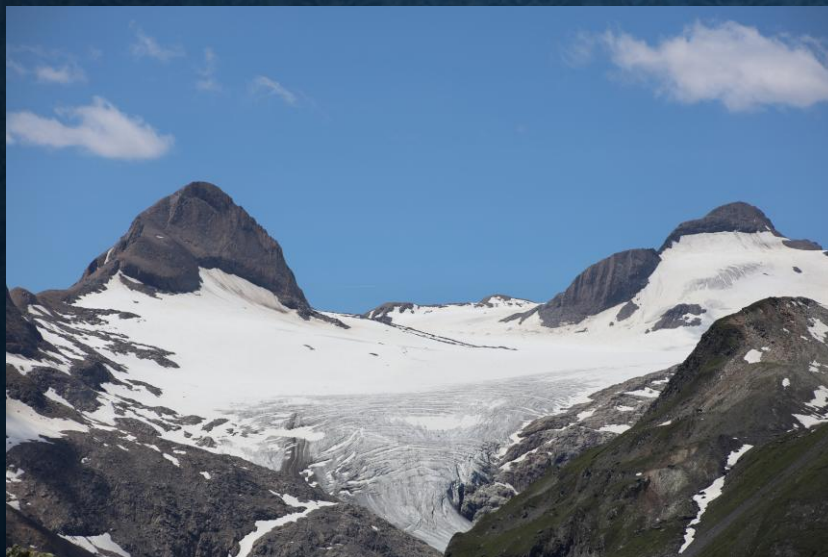
ABOUT ME

- Chemist
 - Former academic
 - Physiologist
 - Biochemist
 - Organic Chemist
 - Depends on the day!
- Wife
- Mom
- Bonus Mom
- Grandmom
- Dog mom
- Jeoper
- Amateur photographer
- Intern Wrangler
- Crafter
- Traveler



San Gottardo Pass
2091 m

Nufenenpass
2479 m



Lesson: I'd rather drive over a few rocks,
than a whole mountain of them

CHASE OR EVOLVE



- **Best Advice:** Don't chase rabbits
 - *Don't follow every idea you have*
 - *Don't follow every "perceived" need*
 - *Don't follow every one else*
- **2nd Best Advice:** Project [Grant] Cycle—3 year of a grant working on the 1st aim on the next grant in the 3rd year
 - *Meaning he was writing about on the Current Idea [to publish], BUT he was working on **NEXT** idea [to get the next grant]*
 - ***Have a 360 view, while Thinking Forward...not review mirror thinking***

DON'T CHASE

EVOLVE

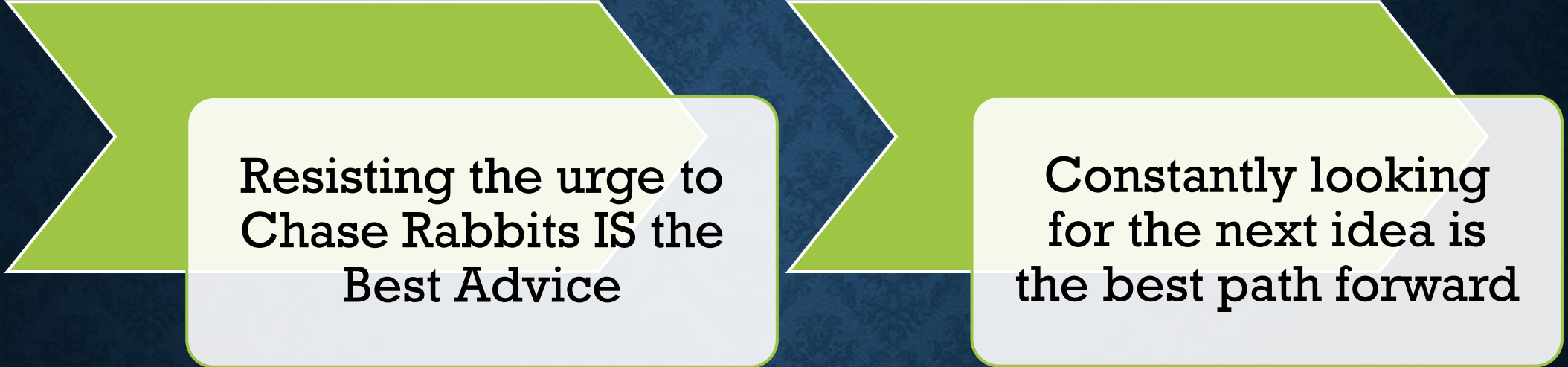
To grow or progress gradually from a simple form to a more advanced one.

Guiding Principle:

“The best analytical labs don't just generate data; they answer business questions”

Respected Mentor

OVERVIEW—WHAT TO EXPECT TODAY



Resisting the urge to
Chase Rabbits IS the
Best Advice

Constantly looking
for the next idea is
the best path forward

IS

Planning for Evolution

Direction not intention, determines destination

~A. Stanley

CONTEXT

Where do
I start?

Which
way do I
go?

What do I do
when *my* vision
diverges from
<fill in>?

What
makes
sense for
my lab?

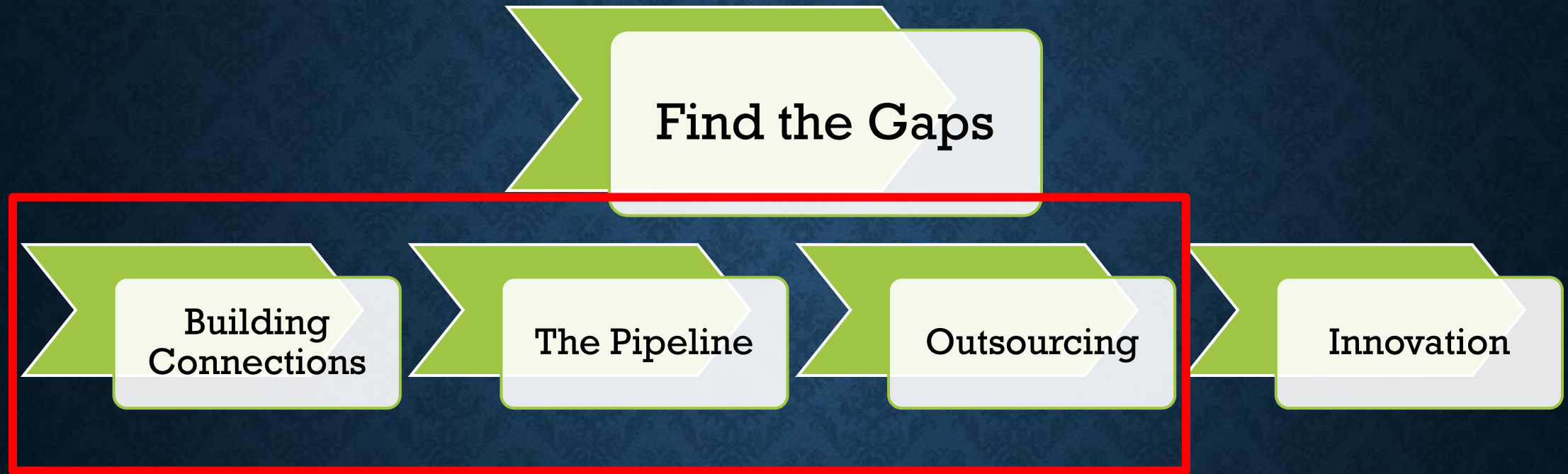
How do I
choose the
next
chemist?

How do I
choose the
next
project?

Predicting
the next
hottest
“need”



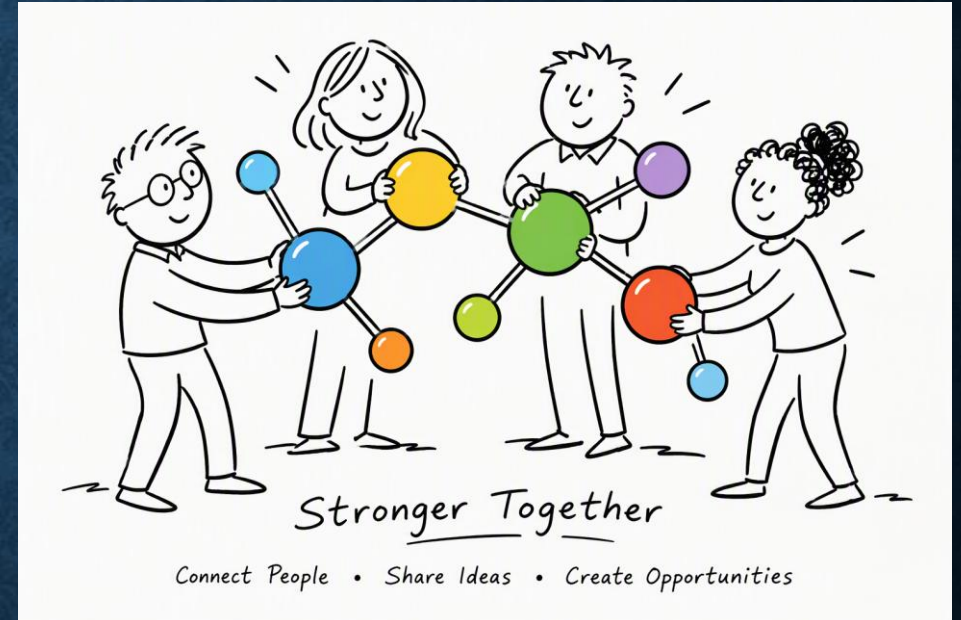
OVERVIEW—WHAT TO EXPECT TODAY



*Evolving Analytical Lab
Or
An Analytical Lab in an Evolving World*

BUILDING CONNECTIONS

- People
- Literature
- Conferences
- Industry Groups—**Carla Saunders** Food Contact Safety Council (Wednesday pm)
- University—**Kieth Vorst**—Iowa State University/Ideopak (Wednesday am)
- 3rd Party Testing Labs
- Trade organizations



Connections

**Networking on Speed and Taken to the Next Level
Builds pathways for evolution**

BUILDING CONNECTIONS

- Anecdote: At a career panel—I was asked by a graduate student, what do you read in your spare time?

My Answer:

Nothing in my wheelhouse



Elaborated with: Nothing that
would end up in a paper on any
current research

Connections

BUILDING CONNECTIONS

- Anecdote: I was asked by a graduate student once, what do you read in your spare time?

Nothing in my wheelhouse

My Answer:



Connections

- Tangential/Adjacent industries
 - E&L / PQRI
- Patents
- Trade journals/articles
- Business journals/articles
- Get out of your comfort zone ...

FILL THAT GAP ***PLUG THAT HOLE?***

- Take inventory of your resources
 - Step back, take inventory, resist the urge to charge ahead!

FILL THAT GAP *PLUG THAT HOLE?*

- Take inventory of your resources

- Instrumentation

What do you have?
What do you need?
What is aging out?
What do you want?
Make a timeline
→ Double it
Growth mindset / growth strategy

- Repeated requests that can't be met

What are the requests that are repeatedly being made?

- Lab Size

What makes sense for your lab?
What makes sense for your company?

- People

How many chemists?
What is the background?
How long have they been in the lab

- Space

Are you space limited?
→ negotiate shared space

FILL THAT GAP *PLUG THAT HOLE?*

What do you have?
What do you need?
What is aging out?
What do you want?

line

set / growth strategy

requests that are
being made?

use for your lab?

ing in the lab

Identifying gaps makes you
ready for innovation
(evolution)

- Take inventory of

- Instrumentation

- Repeated requests

- Lab Size

- People

- Space

Are you space limited?
→ negotiate shared space

UTILIZATION

- Take inventory of your resources

- Instrumentation

What do you have that is never used or under utilized?

Why?

Broken

Why?

- Metal piece attaches to a glass tube
- Tube connection lasted about 2 weeks
- Entire glass housing required replacement



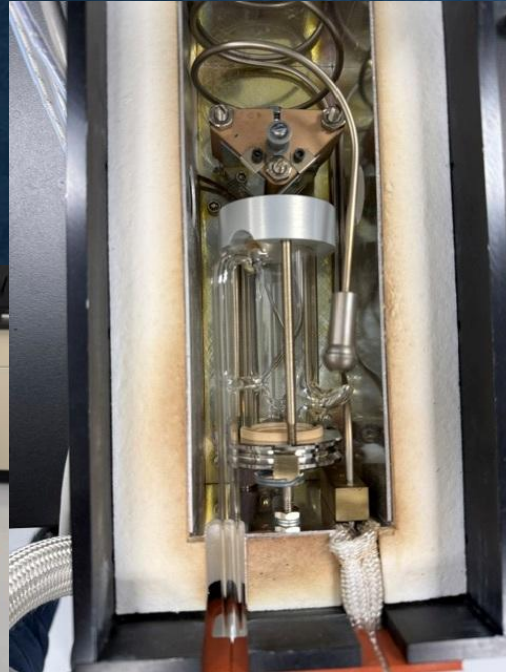
Big Failure in Design

~~UTILIZATION~~ **FAILURE**

- Take inventory of your resources
- Instrumentation

What do you have that is never used or under utilized?

And
Why?



Big Failure in Design

=

Resulted in a Big Paperweight

=

Takes Up Valuable Space

~~UTILIZATION~~ **FAILURE**

- Take inventory of your resources
 - Instrumentation



What do you have that is never used or under utilized?

And

Why?

~~Accepting Failure~~
Opportunity

=

Remove the Equipment

=

Free Up Space
Intern had a desk
New instrumentation
/ equipment

AVOIDING UNDERUTILIZATION

- Take inventory of your resources
 - Underutilized Instrumentation



Back to resources

Pause...I'll revisit this topic

THE PIPELINE

- “With opportunity comes responsibility. [We] are responsible to identify, develop, and launch a new generation of leaders—leaders who will be worth following because of what they saw in [us] and experienced under [our] leadership”
~*Andy Stanley*



Pipeline

THE PIPELINE

- “With opportunity comes responsibility. [We] are responsible to identify, develop, and launch a new generation of [chemists]—[chemists] who will be worth following because of what they saw in [us] and experienced under [our] leadership” *Andy Stanley*



Pipeline

THE PIPELINE

- Talent Pipeline

- Academic to Industry Pipeline / Transition
- Succession Planning
- Chemists worth hiring
 - Bachelors
 - Masters
 - PhD

Where are they?



Pipeline

More importantly, how do I find them?

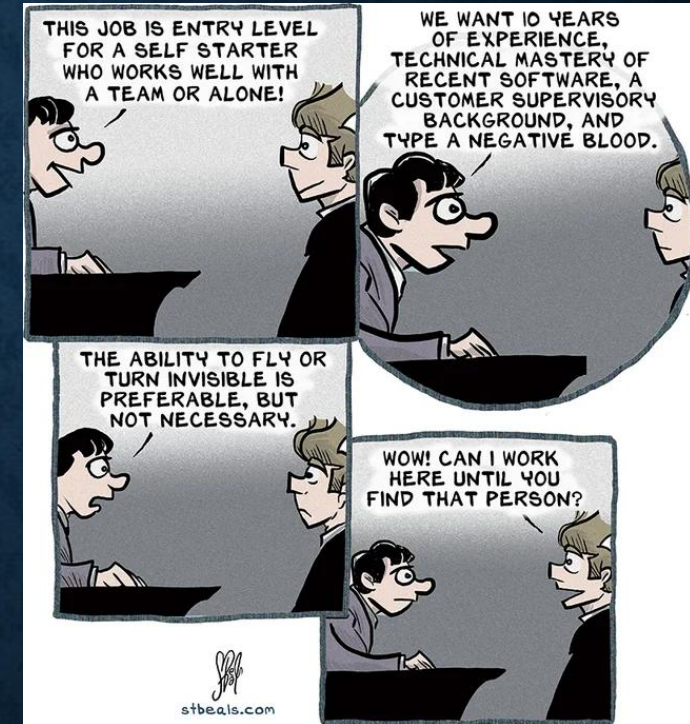
HIRING IS RISKY

Non-negotiable VS. Intangibles

- Education
- Experience

Guarantee to Ideal
Bench Chemist

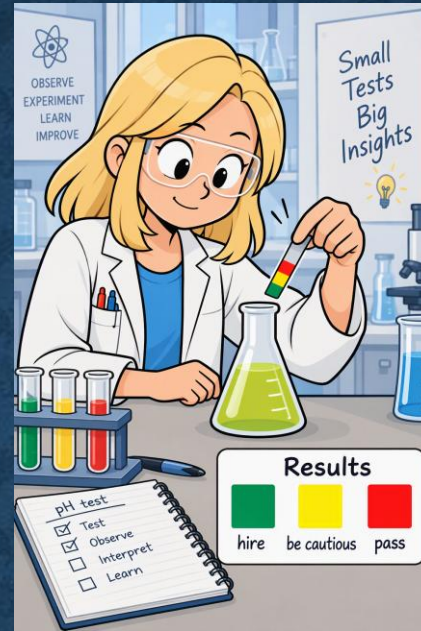
Crutch for the Risk Averse



Starting Point

HOW DO YOU REDUCE THE RISK

Lab Litmus Test



Closely following
directions

“Bad” Hire—in
paper, looks
great

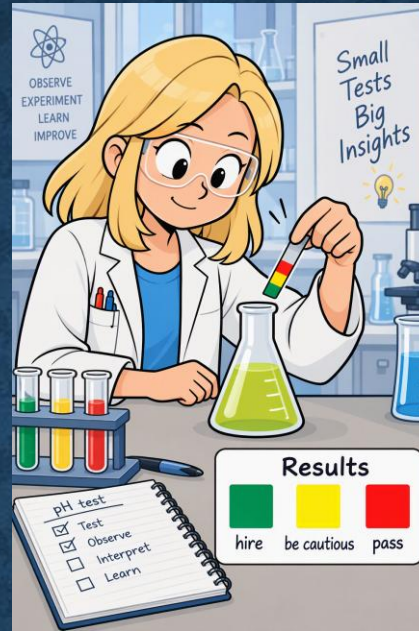


Bad Job Fit—in reality, not
the right fit

HOW DO YOU REDUCE THE RISK

Lab Litmus Test

“Bad” Hire—in
paper, looks
great

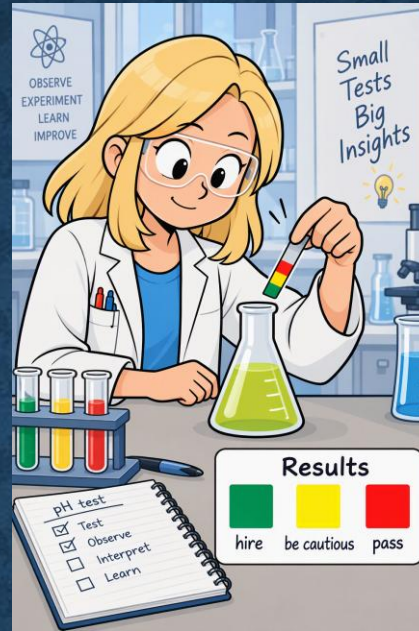


A degree and
experience will not
tell you anything
about how a
person follows
directions nor the
“fit” for a job

HOW DO YOU REDUCE THE RISK

Lab Litmus Test

“Bad” Hire—in
paper, looks
great



Lesson Learned:

Keeping chemists
around that aren't a
good fit is a disservice
to the chemist and the
laboratory

STARTS WITH AN INTERNSHIP

- Finding chemists starts with an internship.

Samantha Berzynski
INX Analytical Chemist
“raw material expert”

Laura Schulz
Former Lawter Award
Recipient
DEA



Olivia Hodge
INX Analytical Chemist
Migration/Quant



STARTS WITH AN INTERNSHIP

- Finding chemists starts with an internship—**and a connection.**
- Symantha Berzynski—INX referral
- Laura and Olivia—recommendation from a connection at Loyola University Chicago



Symantha Berzynski
BS Biology

Laura Schulz
BS Forensic Chemistry



Olivia Hodge
BS Forensic Chemistry



INTERNSHIPS

- Yes, interns are a lot of work for the mentors...
- With Effort and Planning, growth is inevitable.
- Interns are not just a pair of hands, they could be your next Chemist
 - Hosted 2-4 full-time interns and every Friday in the summer 2 additional interns (over last 6 years)
 - 7 interns have been onboarded in Analytical (1 part-time)
- Co-op students

OUTSOURCING

The Right Connections lead to
Positive Outsourcing

Inventory, what's in your toolbox?



Pursue In house
development?

Outsource?

Easy answer:
Do you have right resources?

Instrumentation

Chemists

or

Is this a place you can avoid
underutilized instrumentation

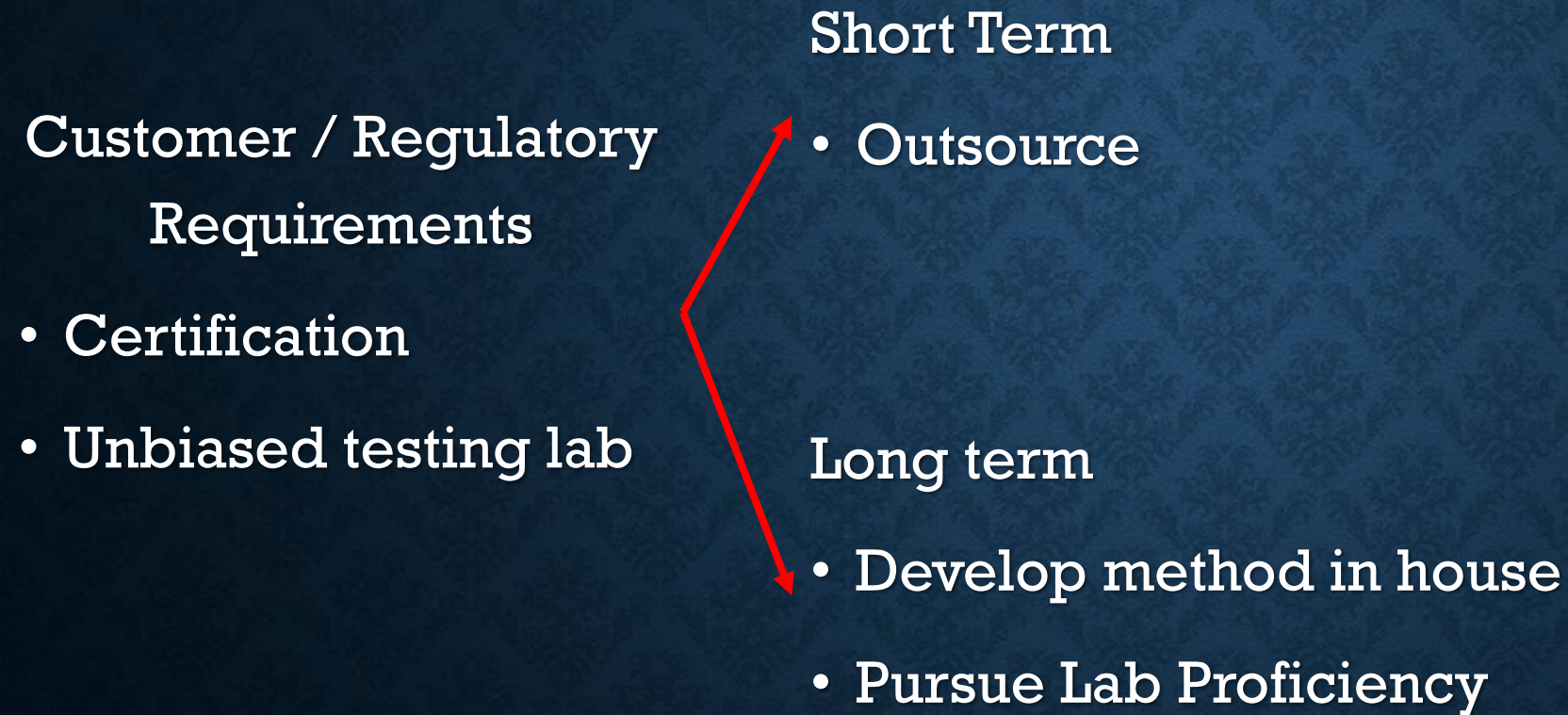


In House



3rd Party Testing Lab

OUTSOURCING—MORE COMPLICATED



Outsourcing

OUTSOURCING—MORE COMPLICATED

- Certification
- Unbiased testing lab
- Time spent of routine testing, takes time away from development
 - Balancing routine or testing for a customer with innovation or development work
 - Pigments—EuPIA AEWG—discussions have been raised for need to screen pigments → *POPs regulations*
 - Outsource or in house?
 - PFAS/PFOA testing—requires expertise and instrumentation
 - If you have both of those, why outsource?
- Regulatory Requirements—Customer or Law

More complicated answer – Innovation



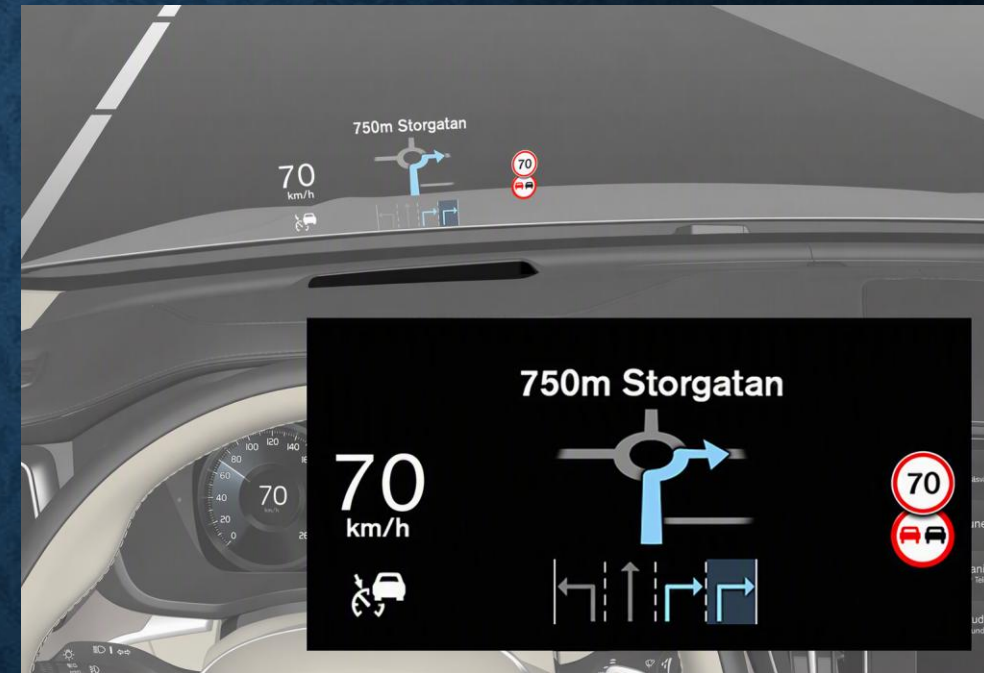
Outsourcing

INNOVATION

- What's innovative about an analytical lab?
 - *You are all thinking it*...raise your hand
- Wouldn't it be great if you had a Road Map that told you which direction you need to go?
 - *You are all thinking it*...raise your hand

Heads Up Display

- ✓ Speed limit
- ✓ No passing Zone/Slow down
- ✓ Direction
- ✓ Correct lane to be in for a turn
- ✓ Roundabout coming



ANALYTICAL INNOVATION

- Finding the direction to move
- Tangential/Adjacent industry/division
- Defines the next project
- Defines instrumentation
- Determine Side Projects—80/20 rule(s)
- Will be different for everyone (prioritize)
- Regulatory influences—US, EU, BfR, Swiss
- What is the analysis that is needed?
- Why is an instrument needed for an analysis
- 80 percent of what we accomplish comes from 20 percent of time spent (Richard Koch)
 1. In context of forward thinking: use 20 percent of your time, looking/read/thinking about the **next big project**

ANALYTICAL INNOVATION

- Finding the direction to move
- Will be different for everyone (prioritize)
- Tangential/Adjacent industry/division
- Regulatory influences—US, EU, BfR, Swiss

• De **Circumstances change—sidelining a project**
• De **for a bigger need happens**

Don't be discouraged
Keep the project in sight

- De
rule(s)

Koch)

1. In context of forward thinking: use 20 percent of your time, looking/read/thinking about the **next big project**

CHASE THAT RABBIT *SUPPORTING BUSINESS QUESTIONS OR FUTILE PROJECTS*

Risks of Trying to Predict the future

Chasing things (rabbits) you won't catch

- Futile Projects
 - Projects with no clear business need
 - Purchasing equipment with no clear business need
- Assessing Risk
 - Process issues
 - Outsourcing
 - Changing Regulations
 - Past Projects



The Futile Chase

CASE STUDIES

- BPA Analysis
 - 2018 Study to detect BPA as a residual building block
 - Current LOD needs
- EuPIA Substrate Swelling
 - 2025
 - Real Food Simulants

BPA DETECTION REGULATORY DETERMINED RAW MATERIAL NEED

Non-Governmental Agencies NGOs	Governmental Agencies
Zero BPA	Limits BPA

What is “Zero”:

- Does “**zero**” mean undetectable?
- Does “**zero**” mean not present in any quantity?

Science is dynamic and constantly changing.

- New Instruments
- Lower Detection Limits
- Increased Sensitivity
- New and Inventive Experimental Methods

WE NEED TO REDEFINE WHAT “ZERO” IS, PARTICULARLY FOR NIAS?

- If we drive down our detection limits and the levels of residual building blocks in raw materials, can we set a **limit of detection** where any BPA below that LOD is equivalent to zero BPA?
- What if we set the **LOD = 34 ppb**

EuPIA GMP Guidance

$$C_{\max} = \text{mass}_{\text{ink}} * C_{\text{ink}} * \text{area}_{\text{coverage}}$$

What is $C_{\max}$, where $C_{\text{ink}} = 34 \text{ ppb} = 0.034 \text{ ppm}$?

$$C_{\max} = (4 \text{ g/m}^2) * 0.034 \text{ ug/g} * (6 \text{ dm}^2/\text{kg}) * 0.01 \text{ m}^2/\text{dm}^2$$

$$C_{\max} = 0.00816 \text{ ug/kg}$$

$$= \textbf{0.00816 ppb max content in food based on EU cube}$$

WHAT'S THE TAKE HOME MESSAGE?

2018

- ***What if we redefined what “ZERO” is, particularly for NIAS?***

- If we drive down our detection limits and the levels of residual building blocks in raw materials, can we set a **limit of detection** where any BPA below that LOD is equivalent to zero BPA?
- If $C_{\text{max food}} = 0.1 \text{ ppb}$, what if we set $C_{\text{ink}} = \text{LOD} = 34 \text{ ppb}$

$C_{\text{max food}}$	C_{ink}
0.1 ppb	416 ppb
0.00816 ppb	34 ppb = <i>current LOD</i>

Is this relevant now?

2018 BPA Study—contact me if interested
in full study

WELCOME TO 2026

REGULATIONS HAVE CHANGED

We are revisiting the past...

- **Regulatory Significance:** EU has a 0.1 ppb limit for BPA
 - **Increased concern** over BPA content from customers to meet European and other (e.g., California Prop. 65) regulatory limits.
 - Is 0.1 ppb achievable?
 - Is it achievable in an extracted ink sample (complex matrix)
- **Why was the testing conducted?**
 - Testing showed BPA to be present BPA was not expected → NIAS.
 - Raw materials have shown BPA at levels exceeding 100 ppm

WELCOME TO 2026

REGULATIONS HAVE CHANGED

We are revisiting the past...

Logan Krajewski, PhD
Analytical Manager
Xuejun Wang, PhD

- **LC-MSMS method developed:**

- Updated LOQ ~10 ppb → 1-10 ppb may be possible, but requires further method development
- Quick turn around time: 9-minute analysis time

- **R&D requests:**

- Increase in Evaluations
 - Inks
 - Substrates
 - Raw Materials (3 positive results)

Filling a Current Need (Gap)

Regulatory Changes Drive
Customer needs which Drive
R&D

- **Ensure no unintentionally added BPA**

- Raw material screen, Formulation screen, Target for migration testing

LESSONS LEARNED

BPA

- Keep methods updated
- Don't just be aware of regulatory changes
- Follow ECHA and FDA news and what ECHA member states propose

**WHY DOES 95%
ETHANOL AT
AN ELEVATED
TEMPERATURE
POSE A
CHALLENGE
FOR
MIGRATION
TESTING?**



Building Connections

Heard around the lab...the bench...(and the ILSI Europe conference 2025)



We know the temperature is too high, but we use it anyway

Doesn't represent real migration

Overestimates migration

Can results be used for compliance?

EUPIA SWELLING PROJECT



Full study available at EuPIA
website, or ask and I can forward
specifics

WHY IS 95% ETHANOL AT AN ELEVATED TEMPERATURE A CHALLENGE?

- **AHA!:** **Decisions are made based on**
Migration > SML
- **REALITY:** **This testing is unlikely to change/affect**
current legislation
- **CHANGE THE CONVERSATION**
 - Discuss results not only in a context of overestimating
actual migration, but also in terms of substrate
permeability.
 - Educate customers
- Use alternatives to using simulants?
 - Tenax
 - Actual Food
- Future
 - Multiple Substrates
 - Permeability studies

AHA!
Opportunity!

BEST RESEARCH LEADS TO MORE QUESTIONS

- Use alternatives to using simulants?

- Tenax
- Actual Food

AHA!
Opportunity!

- Future

- Multiple Substrates
- Permeability studies

Opportunity!
For another
Day

**AND SOMETIMES THOSE
QUESTIONS GET SIDELINED**

OPPORTUNITY

- Develop migration testing using alternative simulants
- Not without precedent
 - Chocolate
 - Oats—dry cereal
 - Sausage
- Not without its problems
 - Dirty process

Isn't this counter intuitive?

Simulants:

- ✓ Remove matrix effects
- ✓ Reduces interferences
- ✓ Cleaner process
- ✓ Makes the overall process smoother

ALTERNATIVE SIMULANT METHOD DEVELOPMENT

- Original Development—started in 2025
- Came back from ILSI, excited, and handed my chemists a couple of papers and said let's try it.



**Lobbing
Grenades**

Madeleine Cannamela
Senior Analytical Chemist

ALTERNATIVE SIMULANT METHOD DEVELOPMENT

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**Lobbing
Grenades**

Madeleine Cannamela
Senior Analytical Chemist

- Path forward wasn't as straight forward
 - Two paths which needed time
 - Concentrator
- Other projects and needs took priority

**Pipeline
Gap
Equipment
Training**

PROJECT SIDELINED BECAME PROJECT INTERN

Pipeline Gap

- Madeleine Cannamela, Senior Analytical Chemist
 - Manages most of our surface analysis and Analytical Digital work
- Olivia Hodge, Analytical Chemist
 - Migration testing, quantitative analysis, MOSH testing
- Hired a Manager and a PhD Chemist

Resource (Equipment/Instrument) Gap

- Needed a more efficient and consistent concentration method

Intern Project!!!

- Gabrielle Fisher, INX Intern “turned” Analytical Technician

ALTERNATIVE SIMULANTS

Not without precedence

- Migrosure Project
- FDA guidance for infant formula
- Tenax
- Nonfat dairy milk powder
- Heavy cream powder

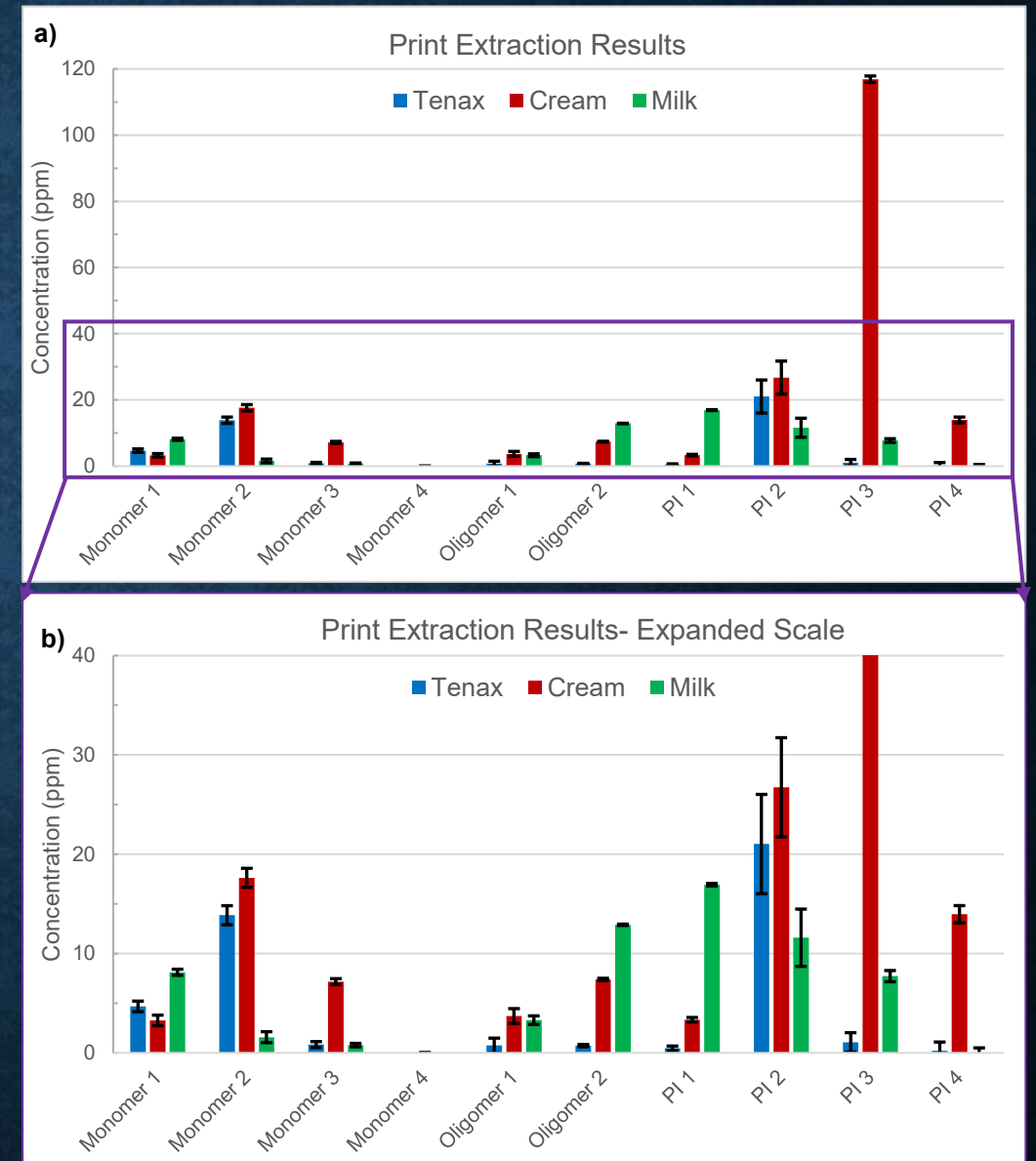
Will Customers
accept NFMD or
heavy cream
powder as viable
simulants?

*Be willing to have the
conversation
With Data
We have Evidence*

VERY MUCH A WORK IN PROGRESS

Aim of study: Test powdered dairy products as real food alternatives to Tenax® when simulating ink migration into dry fatty foods

- Paperboard substrate
- Method development for the extraction
- QuEChERS Quick, Easy, Cheap, Effective, Rugged and Safe

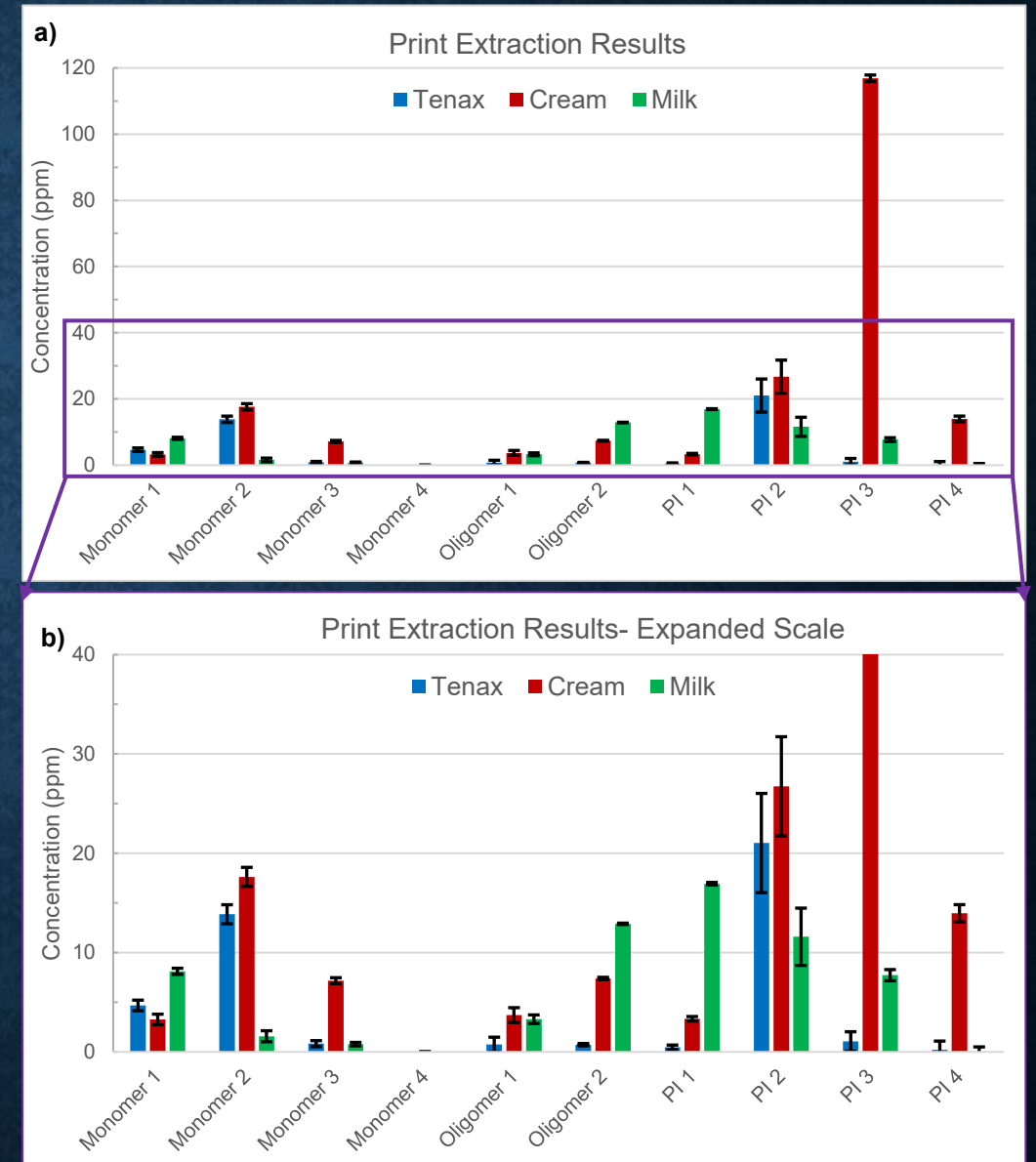


VERY MUCH A WORK IN PROGRESS

Extraction into simulants highly dependent upon polarity

Need to:

- Refine extraction method
- Improve extraction and recoveries
- Use of QuEChERS over comes matrix complexity
- Highlights need for **robust analytical methods**



LESSONS LEARNED

BPA

- Keep methods updated
- Be aware of regulatory changes

Harmonization and Robust methods

- AOAC report
- Alternative extraction / migration simulants

Substrate Swelling

- Patience is a virtue, even if it isn't *my* virtue
 - Project was sidelined until I filled some gaps
- Best Research leads to more questions
- Developing methods when there is no direct need is beneficial
 - Method developments make good intern projects

LAB HARMONIZATION

Thomas Gude and Sander Koster

- AOAC Paper presented at food packaging meeting January
- **Results** between laboratories were **poorly aligned** when their own procedures were used
- Of 64 volatile compounds for screening
 - **No lab identified all 64**
 - **No single compound was identified by all labs**
- Follow Up study is underway

Growth

- Lab to lab harmonization is
- Proficiency testing
 - Inter-lab
 - Intra-lab

Analytical Organizational Feedback

Production

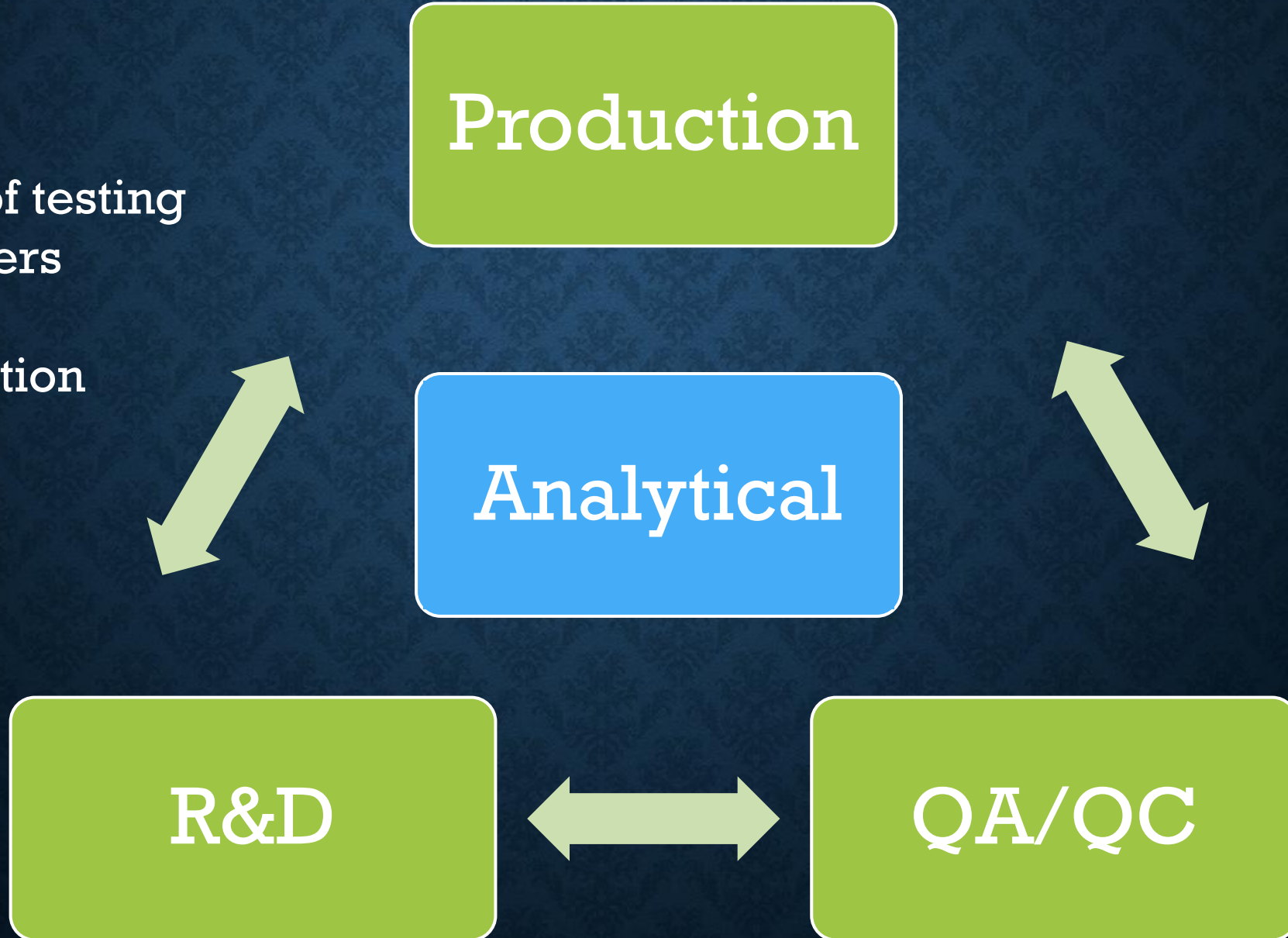
Importance of testing
the testers

Certification

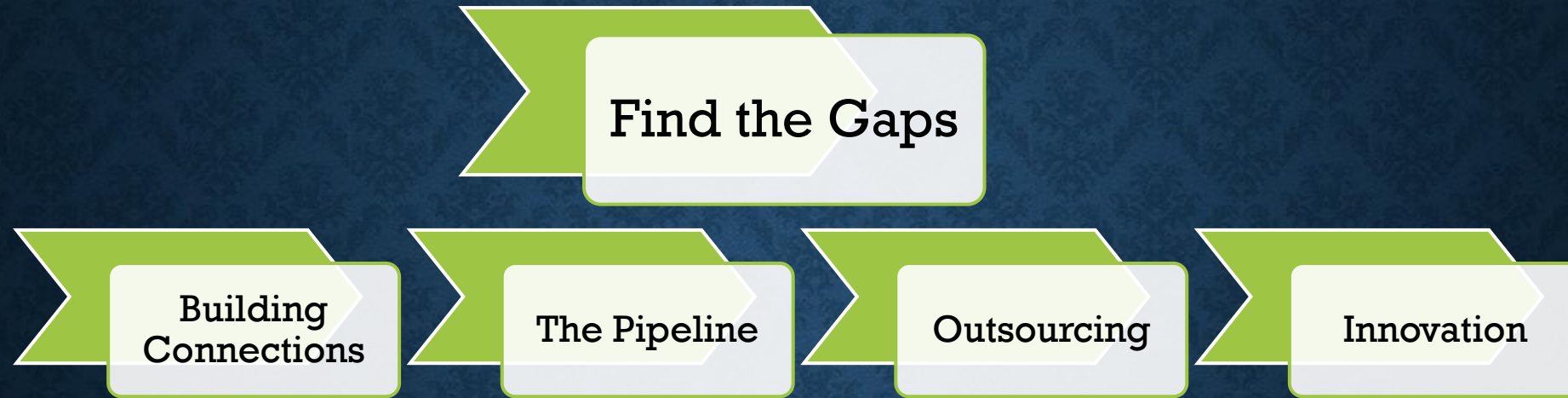
Analytical

R&D

QA/QC



BALANCING ACT



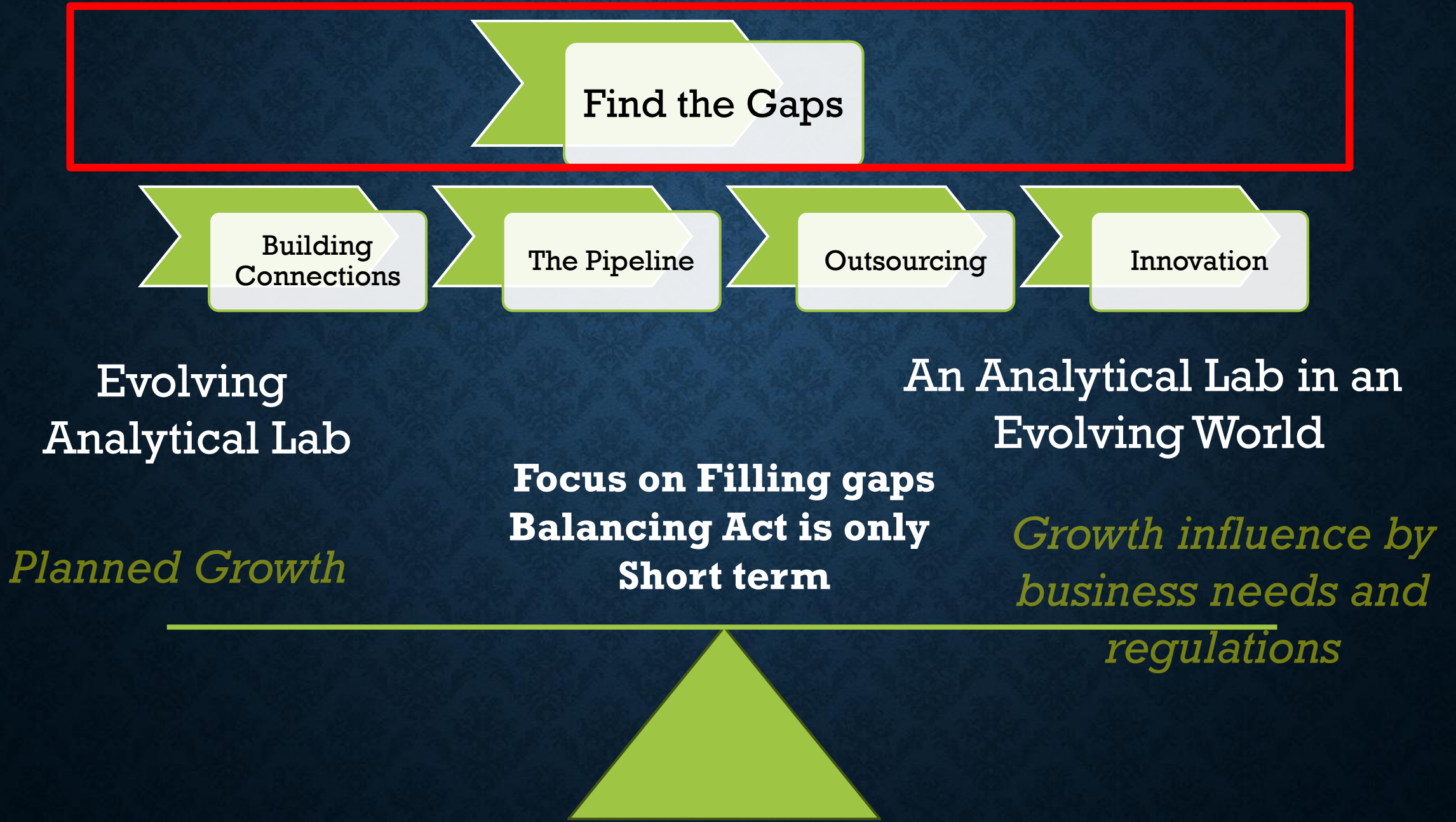
Evolving
Analytical Lab

An Analytical Lab in an
Evolving World

Planned Growth

*Growth influence by business
needs and regulations*

BALANCING ACT



PARTING WORDS OF WISDOM

Employ Strategic Leadership:

Leave the organization better than when you found it

US Army Field Manual

~Gen. Douglas MacArthur

~Ryan Leak, Author and Executive Coach

~Andy Stanley, Leadership Author

~Paul Falcone, HR Leadership

A good [leader], whether he leads a [lab] or a [large company], is expected to look backward as well as forward;
but he must **think only forward**

~General Douglas MacArthur 1933

AND THE AWARD GOES TO... (I MEAN) ACKNOWLEDGEMENTS



- INX International Ink Co.
- Analytical Chemists
 - Logan Krajewski
 - Madeleine Cannamela
 - Olivia Hodge
 - Gabrielle Fisher
- Mark Hill, Senior VP and R&D Director
- Jon Graunke
- Rebecca Lipscomb

BUILDING CONNECTIONS

- Anecdote: I was asked by a graduate student once, what do you read in your spare time?

My Answer:



Connections

As Managers, what can we do?

- Push people out of their comfort zone—that's where they learn
- Encourage training
 - Conferences
 - Online options
 - In house presentations

BUILDING CONNECTIONS

- Anecdote: I was asked by a graduate student once, what do you read in your spare time?

My Answer:



Connections

As Chemists, what can we do?

- Get out of your comfort zone
- Seek and Ask for Opportunities
- **Regulatory Update**—Sara Young and Carla Saunders
- **EPR**—Rebecca Lipscomb
- **EU FCM**—Jennifer Bonanno
- **FDA**—Danny Rubenstein

BUILDING CONNECTIONS

- Anecdote: I was asked by a graduate student once, what do you read in your spare time?

As Chemists, what can we do?

My Answer:

- **EPR**—Rebecca Lipscomb



Connections

EPR

- Association Plastics Recyclers
 - On APR radar for two years
 - Raising concerns and driving decisions

ANALYTICAL EXPERTS WORKING GROUP

- AEWG is a group within EuPIA which tackles common analytical **testing challenges as a group**
- Collaborative Efforts have led to the following:
 - EuPIA Guidance on Migration Test Methods for Evaluation of Substances in Printing Inks and Varnishes for Food Contact Materials **(May 2023 update)**
 - EuPIA Migration Study **(published April 2024)**
 - Migration Testing Challenges: Evidence Accelerated Migration Tests can Induce Physical Changes in Thin Polyolefin Food Contact Materials **(published February 2025)**
 - Migration Testing Challenges presentations: **RadTech 2025, NAPIM 2025**

BACK TO THE ORIGINAL QUESTION: WHY IS 95% ETHANOL AT AN ELEVATED TEMPERATURE A CHALLENGE?



- **REALITY:** This testing is unlikely to change/affect current legislation
 - **AHA!:** Decisions are made based on the Migration > SML
-
- We have the data, what do we do with it?
 - *Conversations with Customers*
 - *Others conduction migration tests*



Time lapse
video of

BACK TO THE ORIGINAL QUESTION: WHY IS 95% ETHANOL AT AN ELEVATED TEMPERATURE A CHALLENGE?



• **CHANGE THE CONVERSATION**

- Discuss results not only in a context of overestimating actual migration, but also in terms of PP permeability.
- Educate customers
- Migration of analytes will **often exceed SML** under accelerated conditions
 - Acts as an **extraction**, not a migration
 - Exceeding SML does not show **non-compliance**
 - From a formulation perspective, we make decisions based on test results
 - Migration > SML change formulation
 - Brand owners/Printer Converters choose ink based on testing results
 - Permeability studies

BACK TO THE ORIGINAL QUESTION: WHY IS 95% ETHANOL AT AN ELEVATED TEMPERATURE A CHALLENGE?



- As Analysts, we need to develop better methods for testing when we suspect the testing conditions are a factor that not only influences the outcome but drives it to overestimation.
- What are the alternatives to using simulants?
 - Tenax
 - Actual Food
- Future
 - Multiple Substrates



Time lapse
video of