Distinguishing Threat from Negative Valence as Sources of Automatic Prejudice against Black Americans

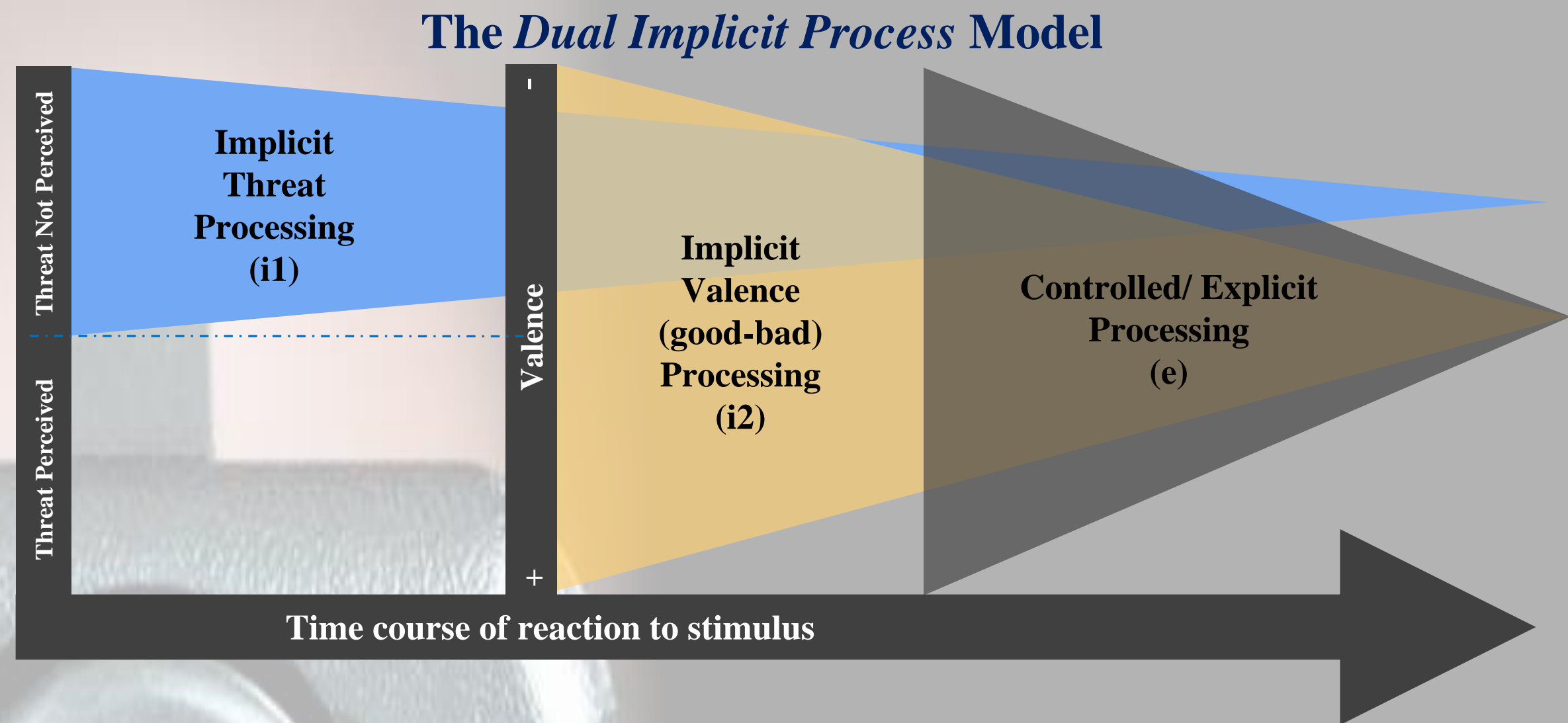**David S. March** (march@psy.fsu.edu), *Department of Psychology, Florida State University*

Background/Introduction

The **Dual Implicit Process Model** (March, Gaertner, & Olson, 2018) distinguishes the implicit processing of physical threat (i.e., "can it hurt me?") from valence (i.e., do I dislike/like it?"). I initially tested this distinction by showing that **threat is responded to uniquely from negativity.**

The threat vs. valence distinction suggests that implicit biases toward social groups can be functionally distinguished between threat- and more evaluative-based prejudices. It might not be the case, then, that White prejudice toward Blacks is driven by a diffuse affective "negativity." But, instead, Whites may fear Blacks, which may manifest as a specific association between Black and threat, and not between Black and negativity.

Three studies tested whether automatic anti-Black prejudice is driven by Whites associating Black with threat, negativity or both.

Functionally Distinct Processes

- **Implicit 1 (i1):** automatically evaluates and responds to *threats to bodily harm*
- Outputs *prior* to and *influences* downstream evaluative processing
- **Implicit 2 (i2):** encompasses the full evaluative continuum (positive-negative) and includes evaluative information beyond threat
- **Controlled/Explicit (e):** propositional, deliberative

The *Dual Implicit Process* Model

Implicit Threat Processing (i1) — Implicit Valence (good-bad) Processing (i2) — Controlled/ Explicit Processing (e)

Threat Not Perceived / Threat Perceived / Valence

Time course of reaction to stimulus

Piloted Target Images

Example images from final stimulus sets

Positive   Negative   Threat

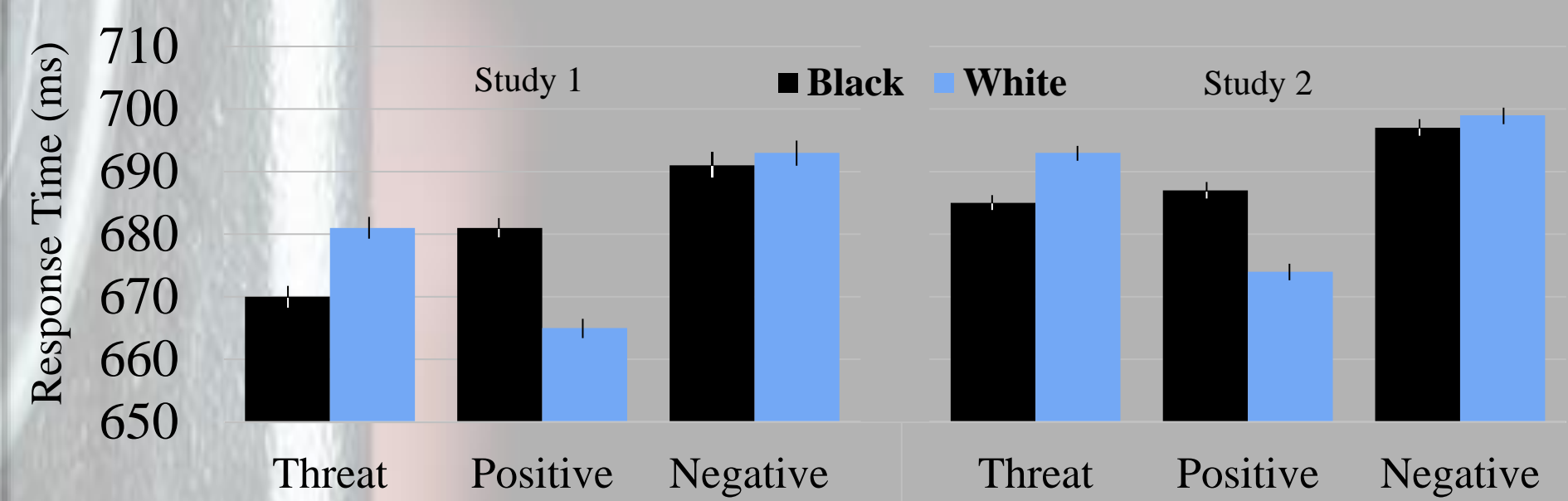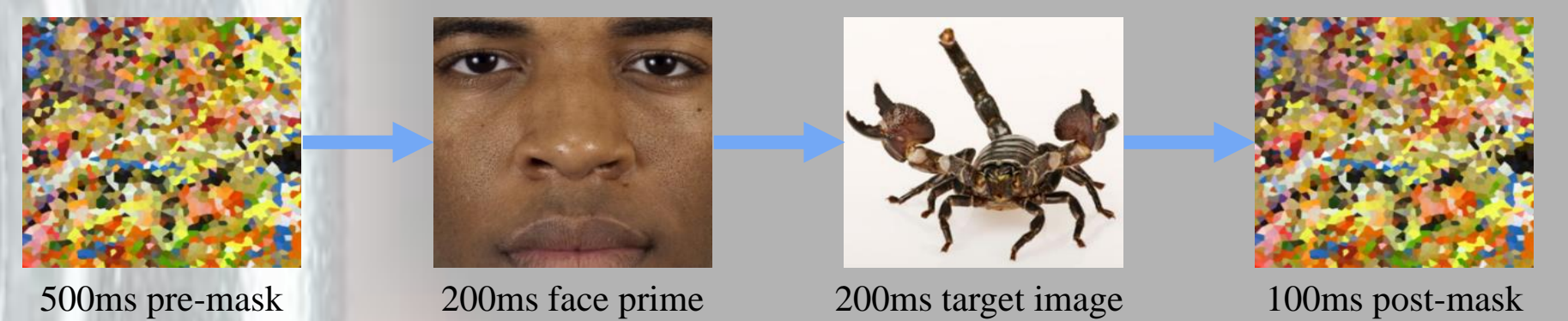| Image Set[a]	Rating Type: Mean (SD)[b]		
	Good	Bad	Threat
Positive	6.14 (0.76)	1.07 (0.18)	1.09 (0.11)
Negative	1.53 (0.47)	4.78 (1.14)	3.18 (1.31)
Threat	2.02 (0.86)	4.40 (1.54)	5.73 (0.99)

[a]Each set contains 40 images.

[b]Rating type varied between-subjects on 7-point scales ("*1 = Not at All*" to "*7 = Extremely*").

Takeaway
Threat and negative stimuli sets are equally negative, only differing on threat.

Studies 1 & 2

Procedure: Assessed how quickly White subjects (*N*'s = 81 & 132) categorize positive, negative, and threatening stimuli as good vs. bad preceded by Black vs. White faces.

500ms pre-mask — 200ms face prime — 200ms target image — 100ms post-mask

■ Black ■ White

Study 1 / Study 2

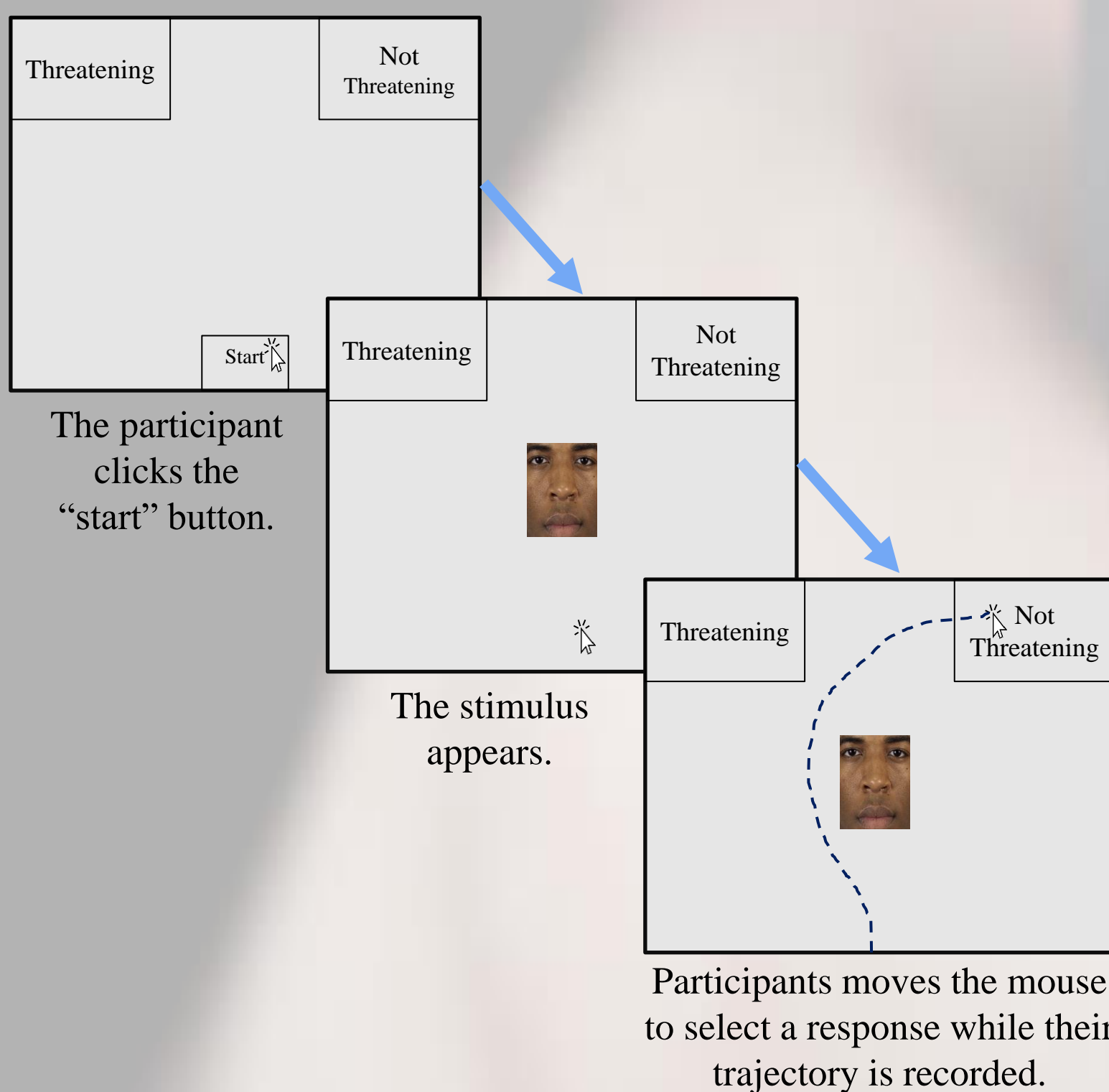Response Time (ms): Threat, Positive, Negative, Threat, Positive, Negative

Takeaway
(1) Threat is more associated with Black vs. White. (2) Positive is more associated with White vs. Black. (3) No evidence of a Black-negative association

Study 3 Methods/Procedure

Procedure: Mouse-tracking task assessed how early in the decision process (*N* = 327) White participants decide whether Black and White faces displaying anger, sadness, happiness, or no emotion are *dangerous*, *negative*, or *positive*.

The participant clicks the "start" button.

The stimulus appears.

Participants moves the mouse to select a response while their trajectory is recorded.
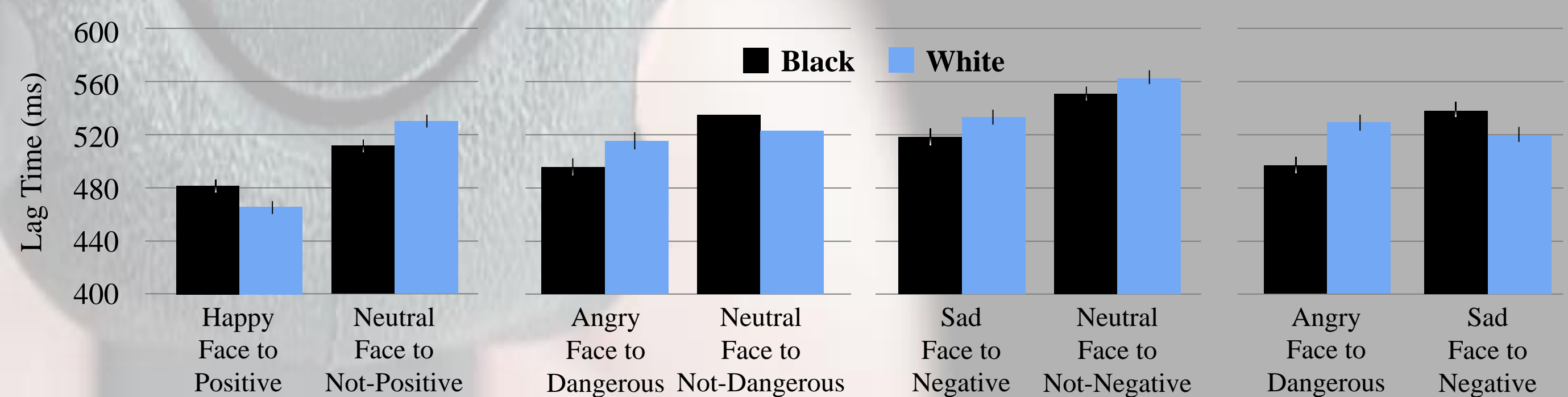
Study 3 Results

The hypothesis-relevant interest is the point in time when participants begin moving relatively closer to the target than distractor label. Calculating the difference in the Euclidean distance from the target and distractor at each time interval yields a sigmoid curve over time as depicted in the below figure.

a. Raw Mouse-Tracking Path

b. Euclidean Distance Difference

Lag phase / *Exponential phase* / *Stationary phase*
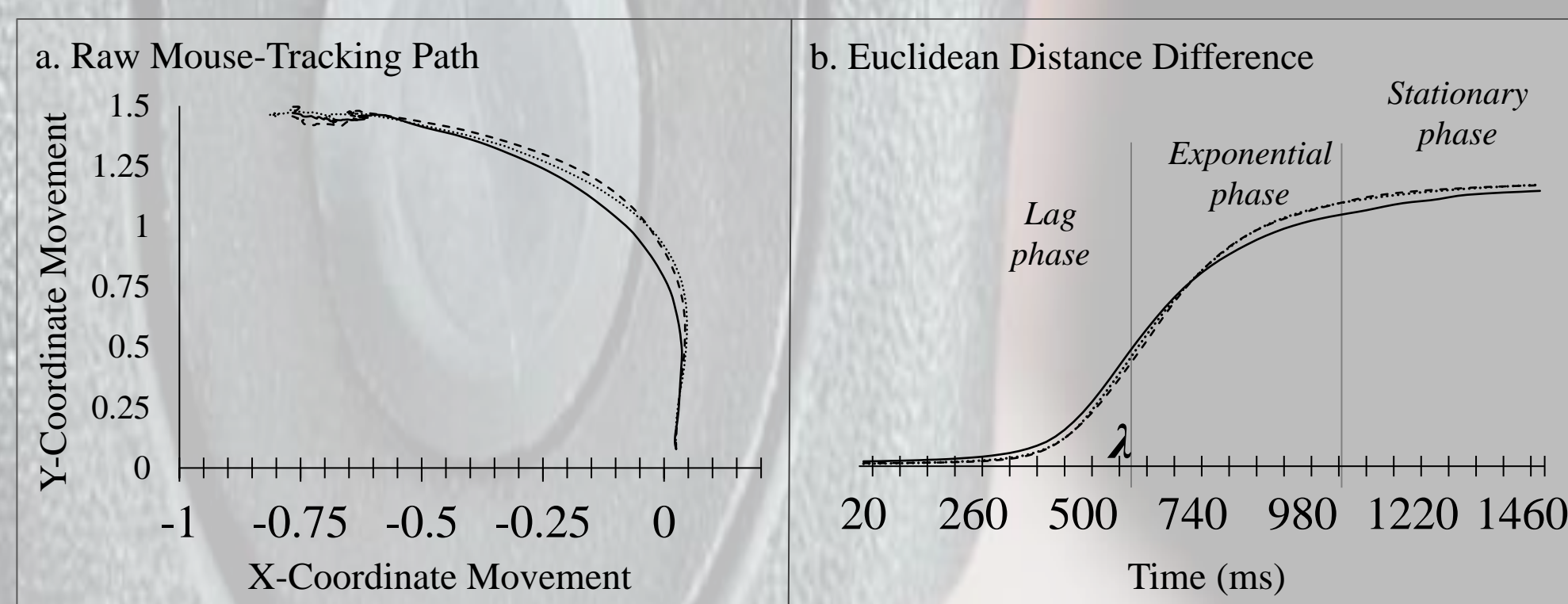
- *Lag phase* is vertical movement bringing mouse equally closer to the target and distractor
- *Exponential* slope is movement closer to the target and further from the distractor
- *Stationary* asymptote occurs as the mouse reaches the target.
- λ is the point when participants begin moving relatively closer to the target than distractor label (i.e. the *lag time*).

■ Black ■ White

Lag Time (ms): Happy Face to Positive, Neutral Face to Not-Positive, Angry Face to Dangerous, Neutral Face to Not-Dangerous, Sad Face to Negative, Neutral Face to Not-Negative, Angry Face to Dangerous, Sad Face to Negative

Takeaway
(1) Threat is more associated with Black vs. White. (2) Positive is more associated with White vs. Black. (3) No evidence of a Black-negative association

Conclusion/Implications

Unambiguous indication that Whites evaluate Black individuals as a survival threat. Threat is not the only response Whites have to Blacks, but perhaps it is often the first response. This may explain why Blacks experience greater use of force in encounters with police than other racial groups. Other automatic valence and explicit responses can occur as well, consistent with the prejudice literature.

Behavioral Economic (BE) Approaches to Understanding Psychological Adversities and Alcohol Outcomes in African American Emerging Adults

The purpose of this study was to examine the role of Substance Free Rewards (SFR) and Delay Discounting (DD) as mediators of the relationship between psychosocial adversities [i.e., Racial Microaggressions (RM) and Adverse Childhood Experiences (ACEs)] and Alcohol-Related Consequences in African American emerging adults.

Although African American emerging adults consume alcohol at lower rates than their White counterparts, they experience higher levels of negative alcohol-related consequences (Zapolski et al., 2014).

Study Variables

Adverse Childhood Experiences (ACEs): Negative experiences that occur before 18-years old (e.g., abuse).

Alcohol-Related Consequences: Negative consequences that result from alcohol consumption (e.g., legal consequences).

Delay Discounting (DD): The level of decrease in subjective value associated with a delay in receiving a reward.

Racial Microaggressions (RM): Subtle forms of racial discrimination that are often unintentional.

Substance Free Rewards (SFR): Activities that do not involve the use of alcohol or other substances but provide pleasure.

Research Questions

1. Are ACEs and RM associated with alcohol-related consequences in African American emerging adults?

2. Does SFR and DD mediate the association of ACEs with alcohol-related consequences in African American emerging adults?

3. Does SFR and DD mediate the association of RM with alcohol-related consequences in African American emerging adults?

Procedure

Data for this FYAP project was derived from Project BETA, a longitudinal study (R01AA024930-01) funded by the National Institute on Alcohol Abuse and Alcoholism (NIAAA) examining constructs of behavioral economics (BE) in emerging adults (ages 22–25). Participants in the study were asked to complete in-person and internet-based assessments every four months for three years.

Participants

Participants (from wave 1) were individuals who identified as African American emerging adults in the Memphis area. Of the 256 African American participants (M_{age}=22.65, SD_{age}=1.03), 178 identified as female and 78 as male.

Data Analysis and Findings

o Four mediation models were tested using the Hayes (2017) PROCESS v 3.5 macro for SPSS v. 25 (model 4).

o In our first path model, there was not a significant indirect effect of ACEs on alcohol-related consequences through SFR, b = -0.0009, 95% BCa CI [-0.0127, 0.0074]. There was also not a significant indirect effect of ACEs on alcohol-related consequences through DD, b = -0.0124, 95% BCa CI [-0.0277, 0.0070]. See Figure 1.

o In our second path model, there was not a significant indirect effect of RM on alcohol-related consequences through SFR, b = 0.0383, 95% BCa CI [-0.0307, 0.1272]. There was also not a significant indirect effect of RM on alcohol-related consequences through DD, b = 0.0185, 95% BCa CI [-0.0610, 0.1185]. See Figure 2.
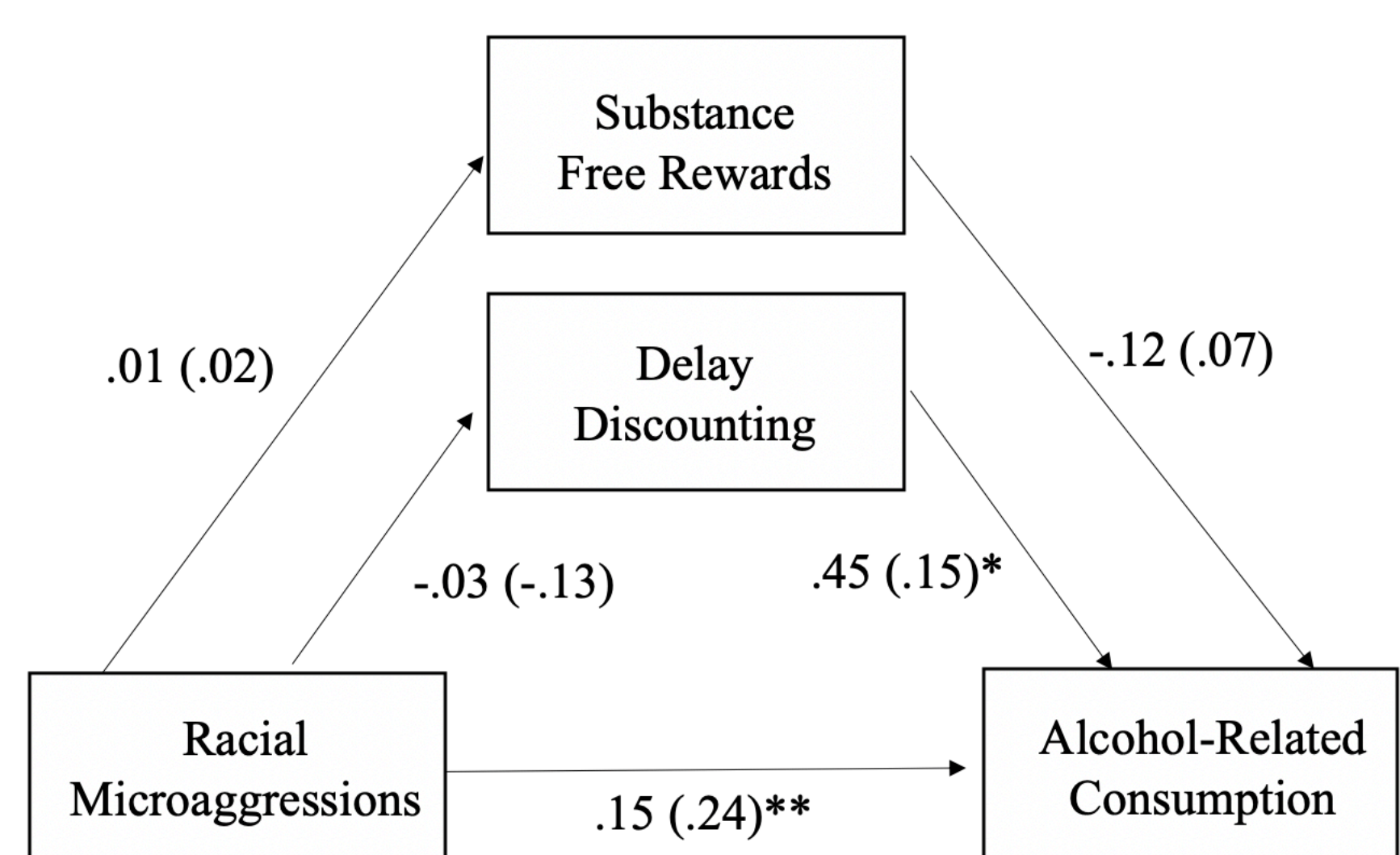
Figure 1
Model with SFR and DD as mediators in the relationship between ACEs and alcohol-related consequences

-.39 (-.14)*   -.10 (-.06)
.09 (.06)   .21 (.07)
.81 (.18)**
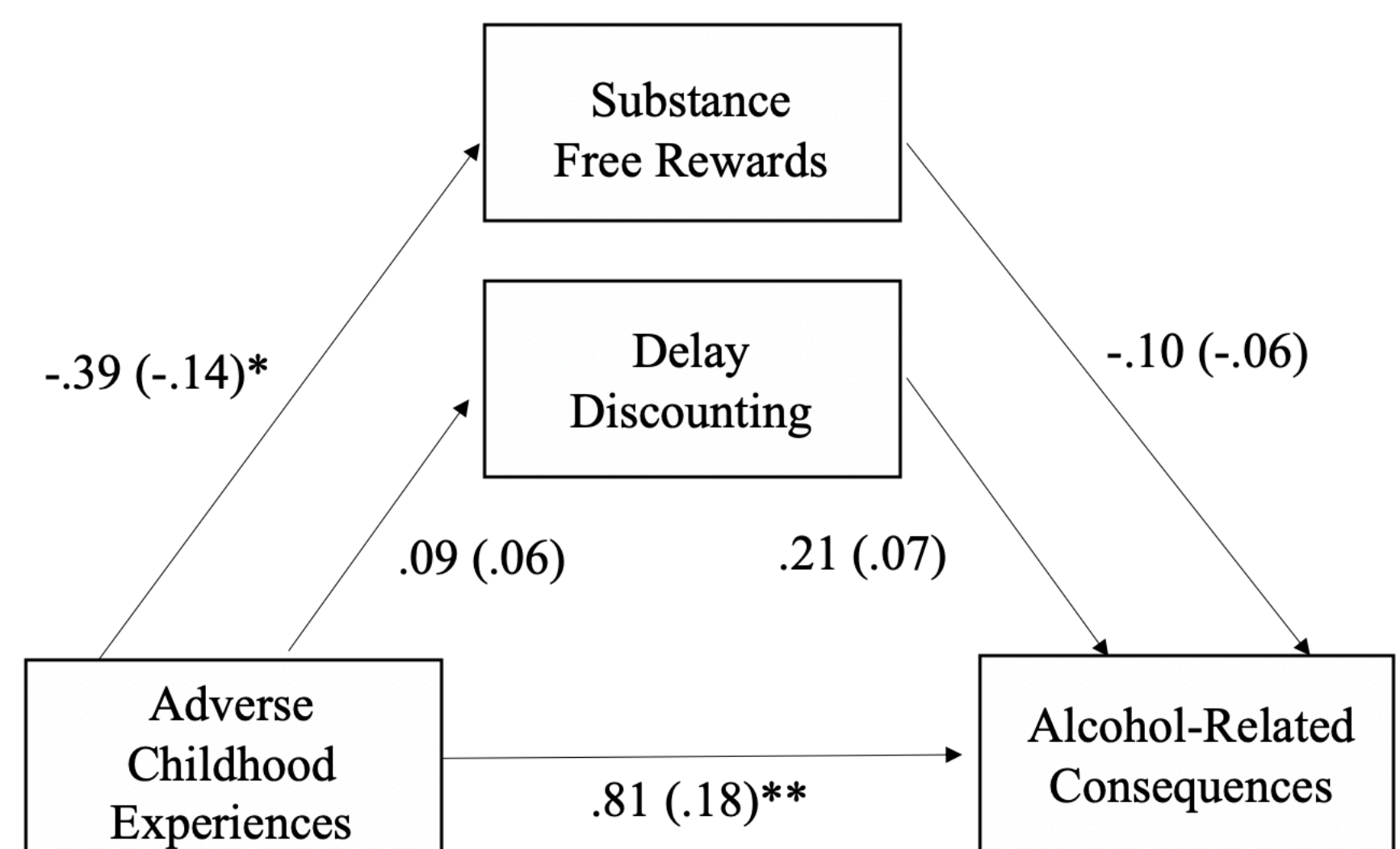
Note. *$p < .05$, **$p < .01$. Standardized coefficients are in parentheses.

Figure 2
Model with SFR and DD as mediators in the relationship between RM and alcohol-related consequences

.01 (.02)   -.12 (.07)
-.03 (-.13)   .45 (.15)*
.15 (.24)**

Note. *$p < .05$, **$p < .01$. Standardized coefficients are in parentheses.

Conclusions and Next Steps

o Positive associations were found between ACEs and alcohol-related consequences, as well as, RM and alcohol-related consequences.

o No significant indirect effects were found.

o Future research should examine additional BE constructs that may relate to alcohol-related consequences in African America emerging adults.

o Results from this FYAP project will be published with Drs. James Murphy and James MacKillop.

Global
Research
On
Working
To ameliorate
Health and career disparities

Research Lab

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Pablo Maurette, Assistant Professor, English Department • First Year Assistant Professor (FYAP) Award

MONSTERS AS CULTURAL MARKERS

In the early modern period, after centuries of being the object of fear and wonder as well as the protagonists of storytelling, travelogues, and chronicles, monsters begin to attract the interest of scientists. The discovery of the New World and the anatomical revolution produces a change in the way exceptional creatures are understood. From being considered ominous signs of divine wrath and harbingers of danger, they become markers that help us decode the mechanisms of generation, the intricacies of morphological variety, and the nuances of cultural diversity.
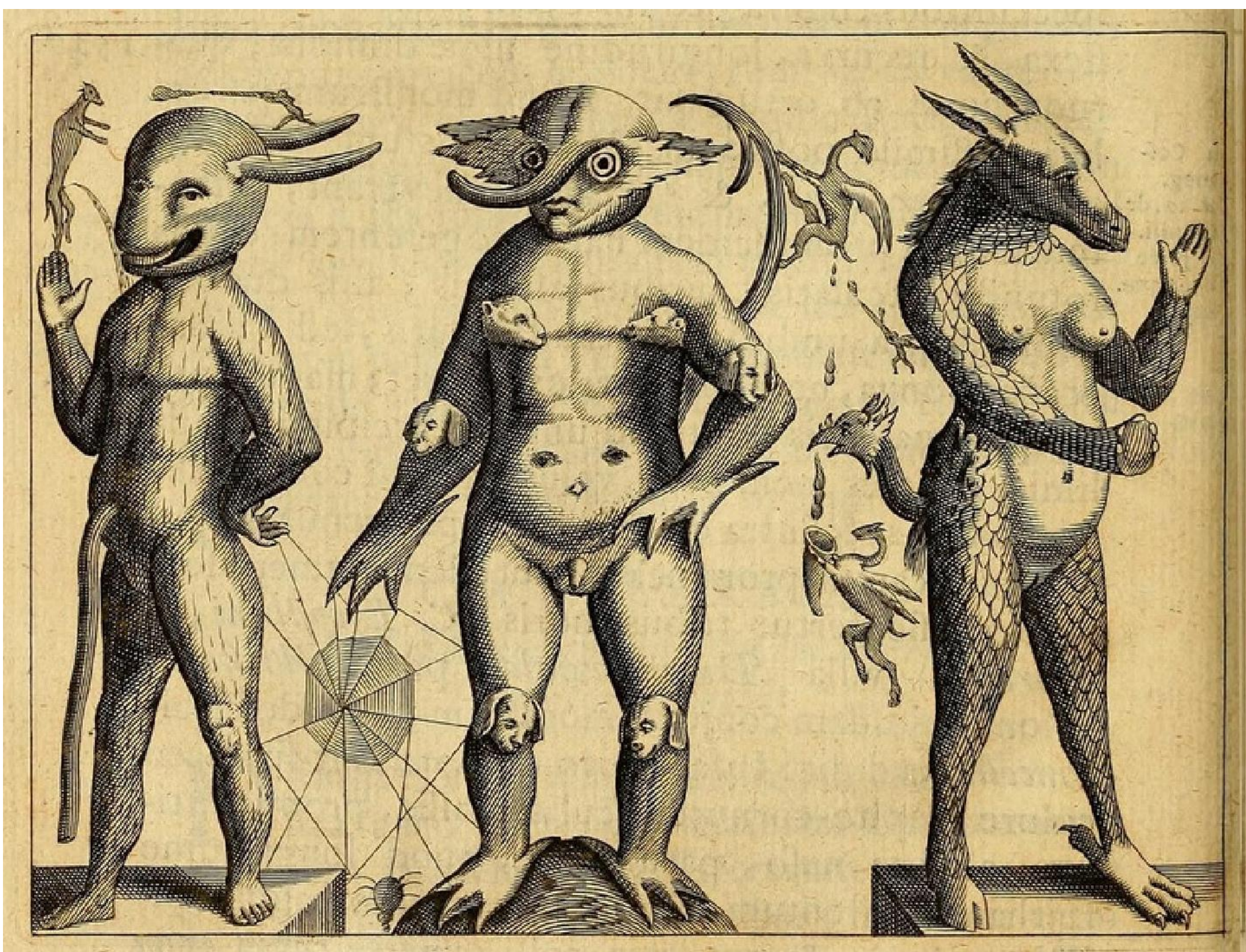
Fortunio Liceti, *De monstris* (1665)

BRIDGING SCIENCE WITH THE HUMANITIES

Many early modern approaches to the topic of monstrosity, such as Liceti's, provide us with a template to imagine new ways of bridging the natural sciences, in particular medicine, and the humanities. In early modernity, and especially within the context of the so-called scientific revolution, the richness of the connection between experimental science and the artistic imagination comes to the forefront with unprecedented force. At a time like ours of hyperspecialization, I hope to bring forth the rich complexity of an approach that successfully combines areas of the human intellect today commonly perceived as disconnected from one another.

OTHERNESS IN TODAY'S WORLD

The topic of how we understand and enter into dialogue with otherness has never been more relevant than it is today. As we all, at least in the western world, try to navigate as smoothly as possible the fact that we exist in constant contact with radical diversity, the tendency to demonize, objectify, and stigmatize the other is as strong as it has ever been. Having access to, and participating actively in vast and immediate public digital platforms, we are exposed to otherness constantly and we all run the risk of falling into old, nasty habits vis-à-vis their mere existence. My work on early modern notions of monstrosity hopes to bring to the forefront a debate that many may consider to be closed, the debate concerning the true meaning of acceptance and tolerance, and the issue of the normal versus the abnormal. I hope to remind readers that, as French sociologist Gabriel Tarde once said: "Normalcy is the degree zero of monstrosity".

Pierre Boaistuau, *Prodigious Stories* (1560)

RESULTS

This summer and thanks to the FYAP funding I was able to concentrate on the philosophical foundations of one of the most common approaches to the topic of monstrosity in the period: Aristotelianism. Aristotle was the first thinker to take an interest in monsters from a scientific and philosophical point of view. His most dedicated follower in the early modern period was Italian physician Fortunio Liceti, the pioneer of modern teratology. Liceti's works have not been translated to any modern languages, so I spent the summer working on the Latin text as well as on secondary bibliography that guided me along. The result of my work is "Monstrosity and the Monstrous Revisited: The Medical Imagination of Fortunio Liceti," an article that is forthcoming in a collected volume dedicated to the Medical Humanities.
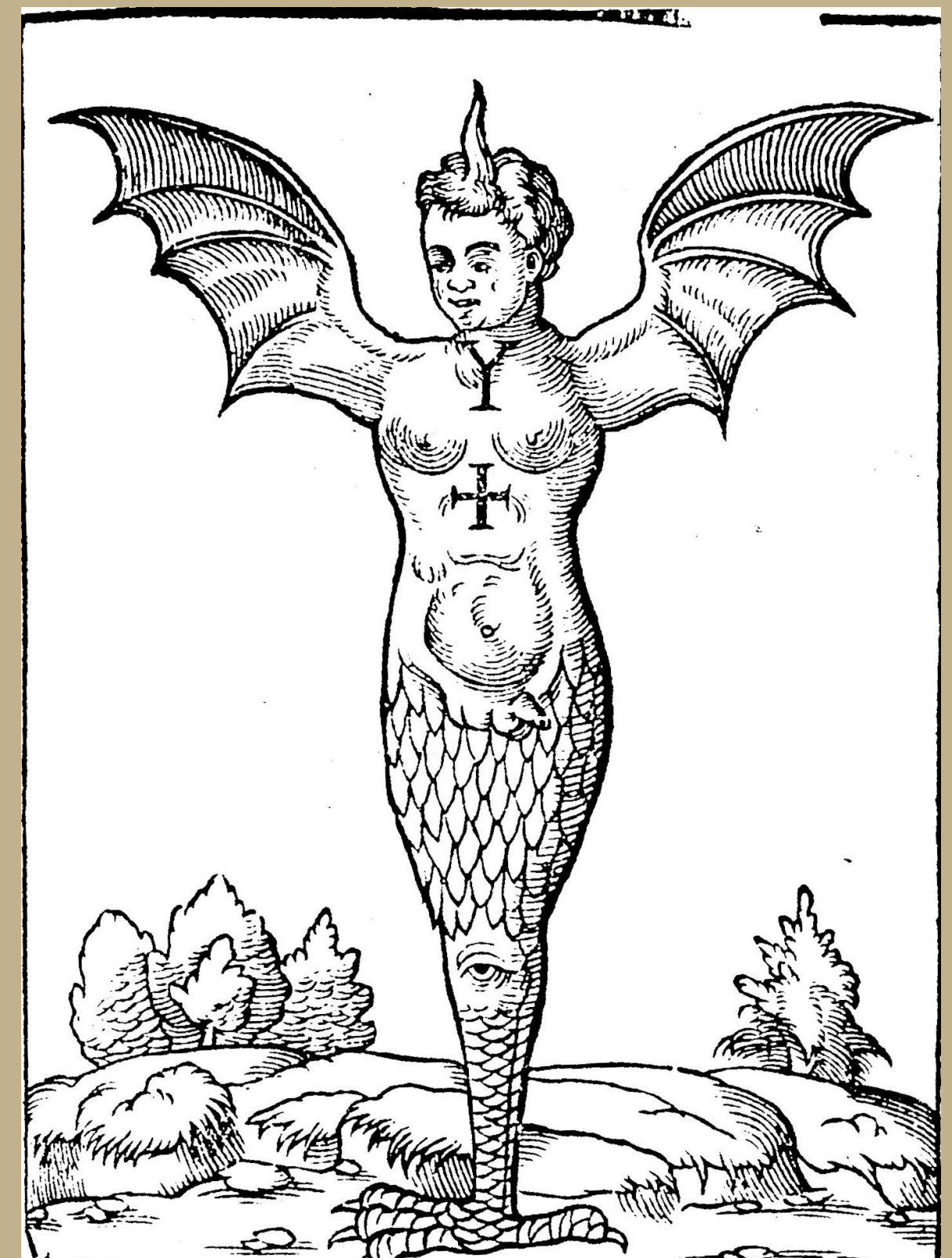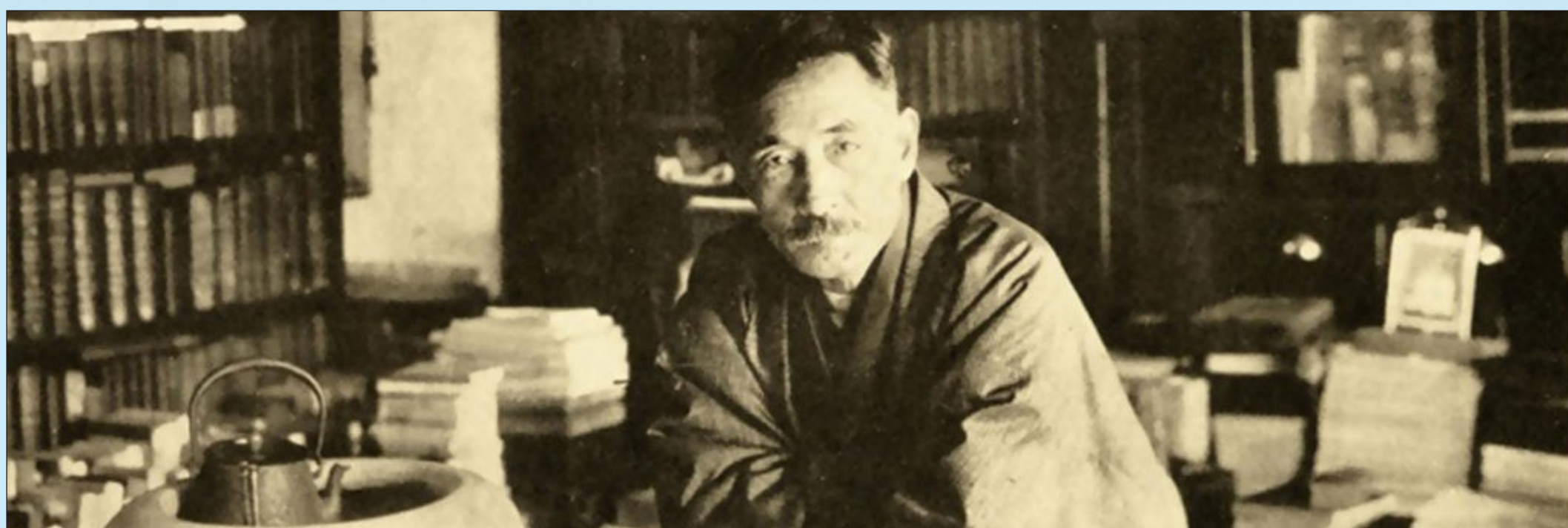

Ambroise Paré, *On Monsters and Marvels* (1573)
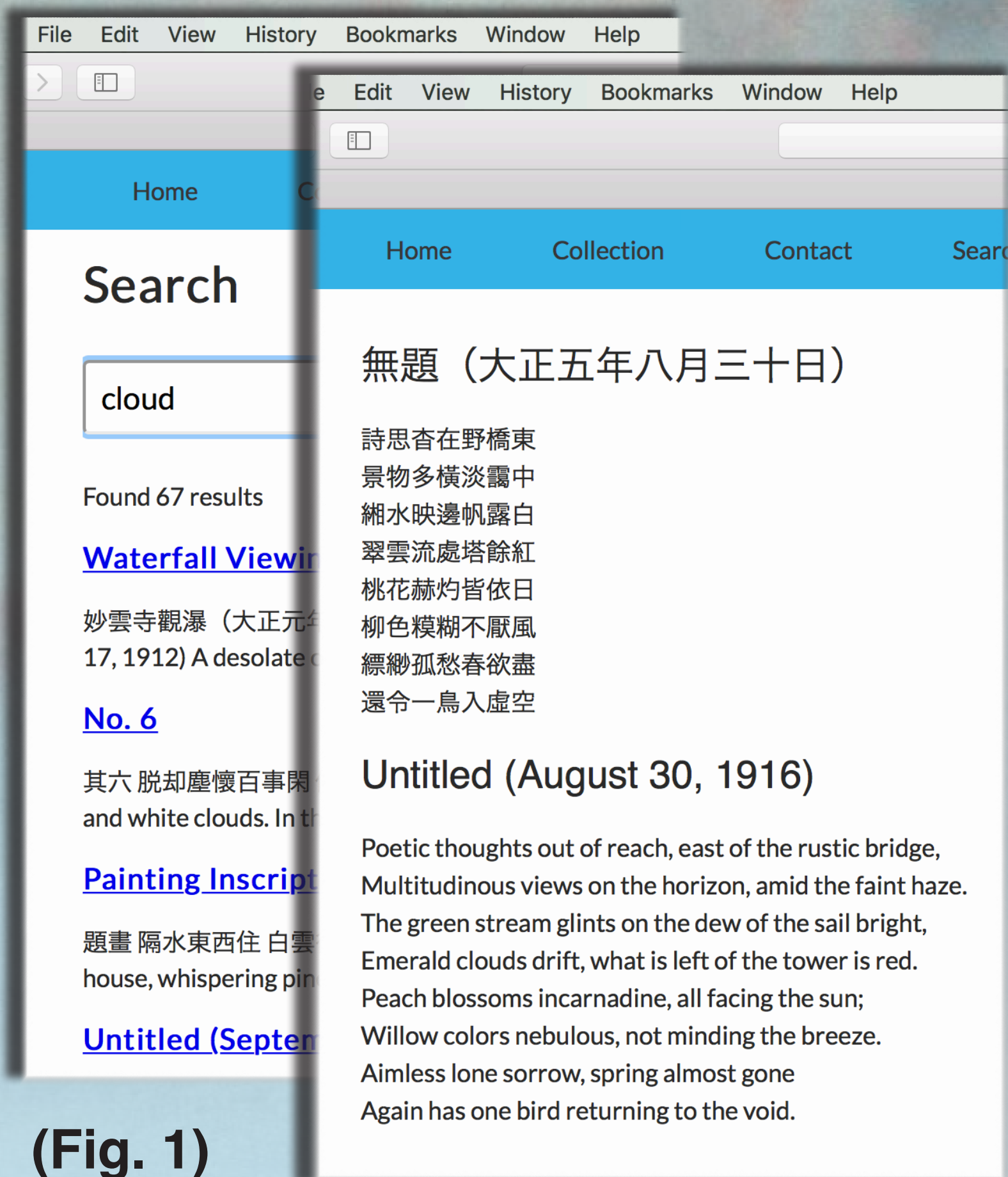
The Sōseki Poetry Project
A Multimedia Digital Database

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(Fig. 1)

Search

cloud

Found 67 results

Waterfall Viewin...

妙雲寺觀瀑（大正元...
17, 1912) A desolate ...

No. 6

其六 脱却塵懷百事閑...
and white clouds. In t...

Painting Inscript...

題畫 隔水東西住 白雲...
house, whispering pi...

Untitled (Septer...

無題（大正五年八月三十日）

詩思杳在野橋東
景物多橫淡靄中
繩水映颿帆露白
翠雲流處塔餘紅
桃花赫灼皆依日
柳色模糊不厭風
縹緲孤愁春欲盡
還令一鳥入虛空

Untitled (August 30, 1916)

Poetic thoughts out of reach, east of the rustic bridge,
Multitudinous views on the horizon, amid the faint haze.
The green stream glints on the dew of the sail bright,
Emerald clouds drift, what is left of the tower is red.
Peach blossoms incarnadine, all facing the sun;
Willow colors nebulous, not minding the breeze.
Aimless lone sorrow, spring almost gone
Again has one bird returning to the void.

INTRODUCTION:

Natsume Sōseki (1867-1916) is regarded as modern Japan's greatest novelist. He was also a scholar and critic of English literature, a philosopher, and a poet, composing over three thousand poems in his lifetime. "The Sōseki Poetry Project" is the first multimedia digital database to compile Sōseki's total 208 *kanshi* (Chinese poems) and a selection of 200 haiku (the seventeen-syllable verse form) in their original language and in English translation, and a selection of his paintings and calligraphy. URL: **https://fsudrs.github.io/soseki/**

RESEARCH PROJECT:

The FYAP award made it possible to complete the initial stages of the project: 1. the digitization and translation of over 400 poems; 2. the design and construction of the database (Fig. 1), with the assistance of FSU Digital Humanities Librarian, Sarah Stanley.

OUTCOMES:

The search function of the database has enabled me to identify keywords and begin philological analysis. For example, "cloud" 雲 (*un*; *kumo*) is a keyword that appears 67 times in Sōseki's *kanshi*. In these poems clouds evoke the ideals of transcendence and impermanence in Daoist and Buddhist thought, and serve as figures for the lyrical and elegiac feelings represented in nineteenth-century Romantic poetry and painting.

The multimedia function of the database illuminates the multiple contexts that inform the meaning of a keyword by linking it to other works through its metaphorical and metonymical associations across media. Sōseki represented clouds in Chinese-style landscapes (Fig. 2) and in European-style watercolor paintings (Fig. 3). In these visual works clouds evoke melancholy through figurations of spatial distance and indistinctness.

NEXT STAGES:

[Database work]
-Begin critical annotations for the corpus of poems.
-Continue uploading related media (paintings, calligraphy, letters, etc.).
-Continue identifying keywords and begin writing entries that discuss the various contexts (literary, historical, philosophical, cultural) that inform their meaning.

The database will eventually include media beyond Sōseki's oeuvre, such as works by other poets and painters that informed his creative process.

[Writing for publication]
-an article that introduces Sōseki's poetry (*kanshi* and haiku) to the field of Digital Humanities.
-an article that examines how keywords such as "cloud" put Sōseki's poetry in conversation with the East Asian tradition and nineteenth-century British Romantic painting (i.e. J.M.W. Turner, John Constable) and poetry (i.e. Wordsworth, Keats, Shelley).
-begin work on a monograph that examines what the poetic genres *kanshi* and haiku reveal about the wonders of Sōseki's poetic imagination.
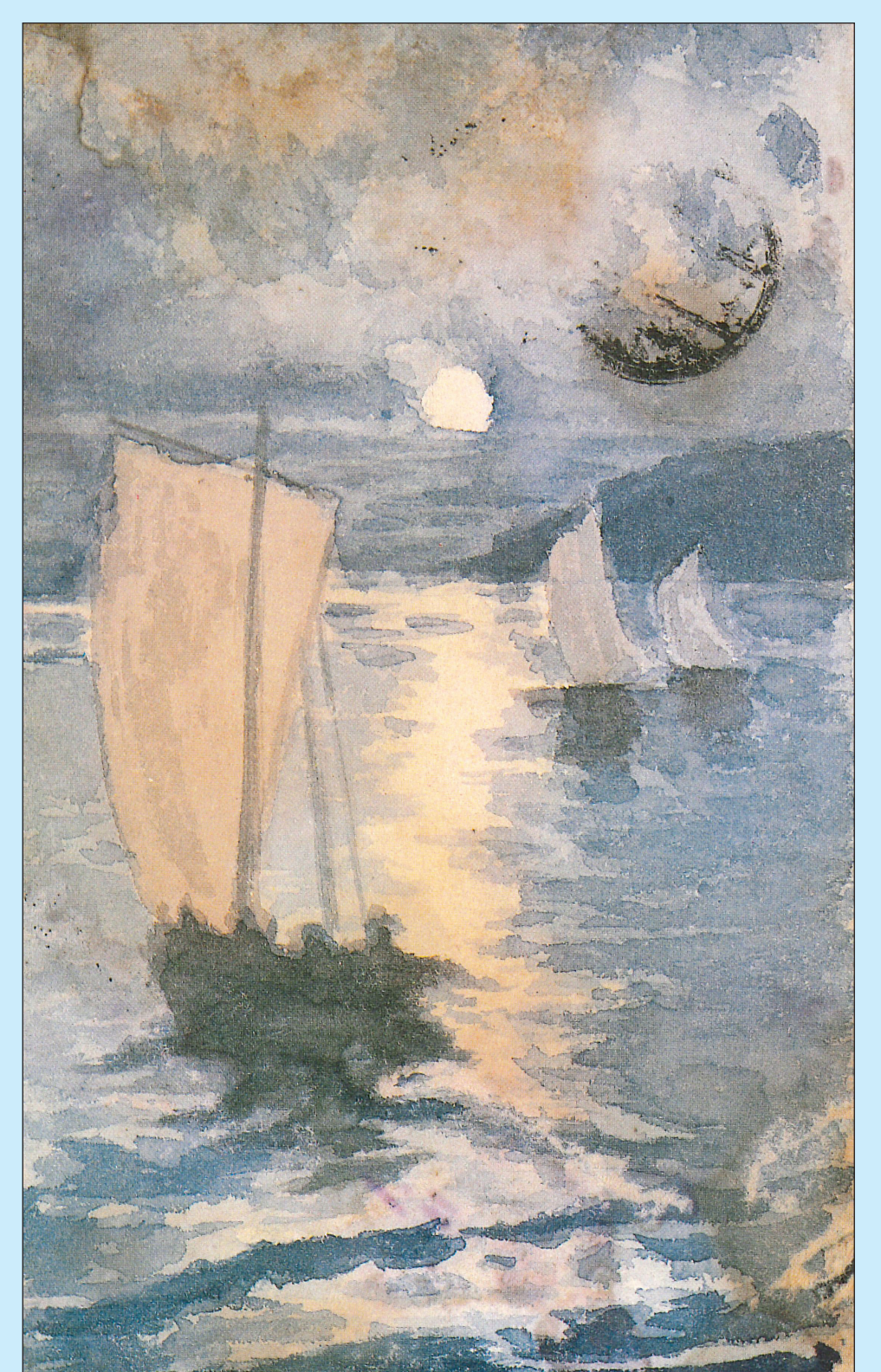
(Fig. 2)   **(Fig. 3)**

(From *Natsume Sōseki ibokushū*, 6 vols. Tokyo: Kyūryūdō, 1979. Reprinted with permission.)

In-situ Direct Magnetic Loss Measurement in a DC-DC Converter

Magnetic loss is extremely important in power converters

- As the biggest loss in a power converter, it drives majority of very important decisions at a converter level, e.g., topology, optimization, switching patterns, etc. Accurate identification of the loss is crucial for all the design decisions.

Conventional approaches? Why *In-situ*?

- Conventional approaches for magnetic loss identification have been
  1) **Estimation** of the loss using **3rd party datasheets**
  2) Usage of **separate testing platforms** that **mimic** real converters.

- Extremely efficient power converters now reach beyond 99% in efficiency – nonlinear, secondary magnetic effects governs the loss mechanisms
  1) A crude model based on 3rd party datasheet is no longer sufficient
  2) mimicry also cannot provide the precision for efficient power converters

What are the challenges?

$$D_{\text{LOSS}}(\theta) = P_{\text{LOSS}}^{\text{Meas}_1}(\theta) - P_{\text{LOSS}}^{\text{Meas}_2}(\theta)$$

$$\frac{\partial D_{\text{LOSS}}(\theta)}{\partial \theta} = \frac{f(S_2^2 - S_1^2)}{3L}|\theta|^3 + \frac{fV_H(S_1 - S_2)}{L}\theta^2 + \left(\frac{fV_H^3}{3LS_1} - \frac{fV_H^3}{3LS_2}\right)$$

- Waveform fidelity
- Differencing resolution, Grounding issues
- **Channels' Synchronicity (Timing Skew [θ])**

What and how did we solve?

- Just like Heisenberg's Uncertainty Principle, we cannot perform multiple arbitrarily high precision measurements at the same time. We circumvented by gathering more information about the circuit topology itself to construct a very target specific model. Although it is no longer a universal measurement, it guarantees precision and skew elimination simultaneously.
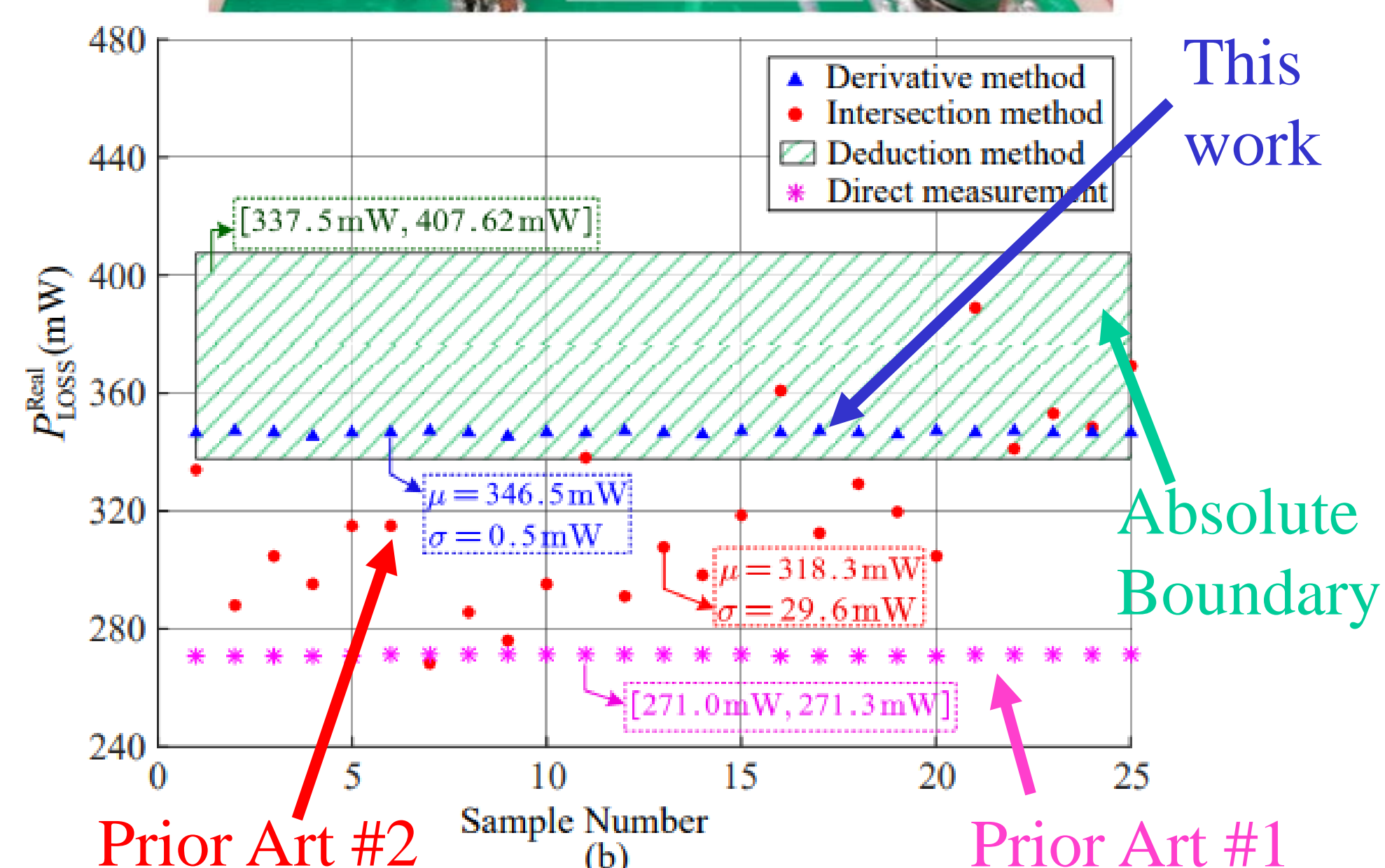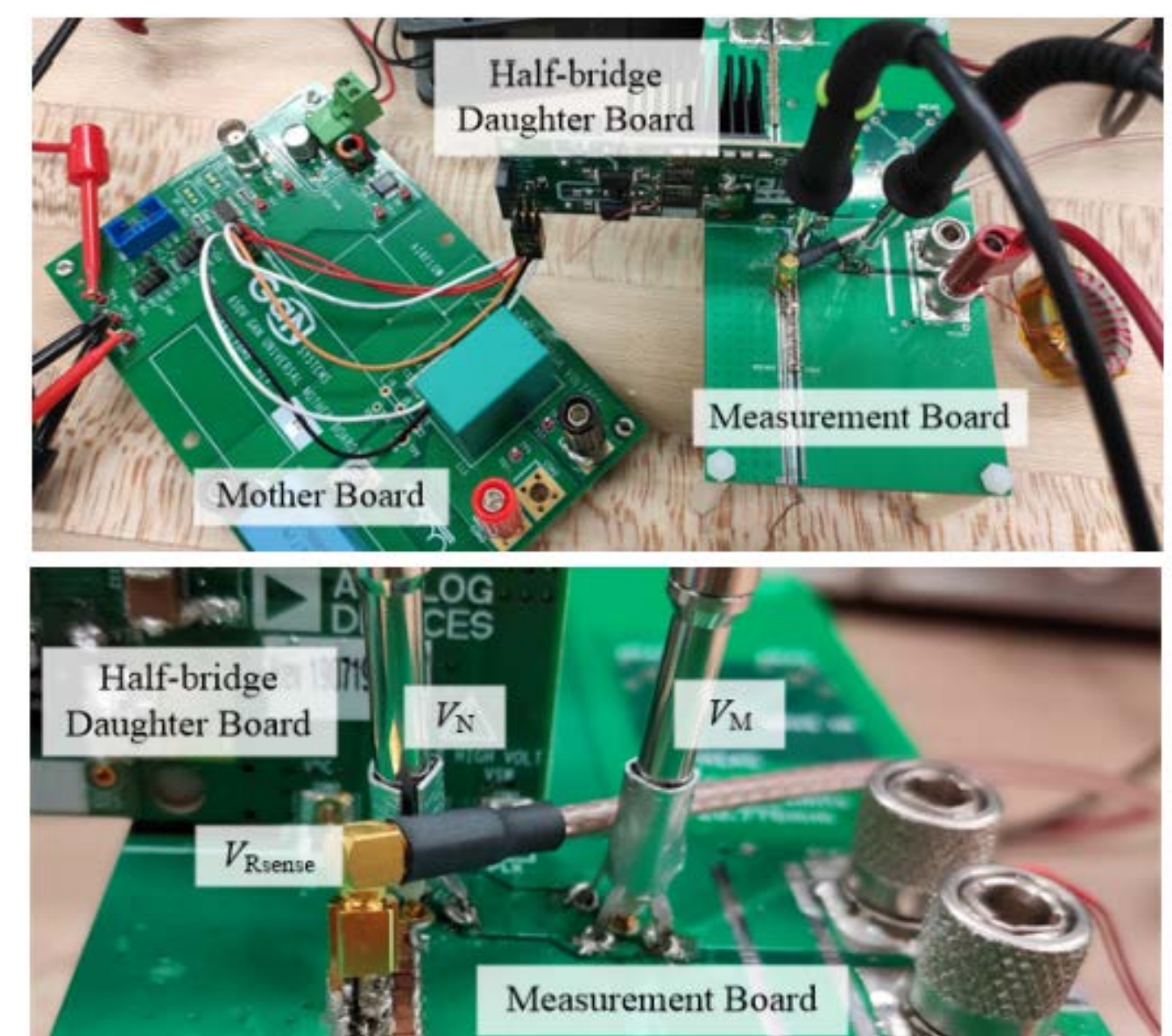
What are the next steps?

- Completely non-invasive methods

Potential funding opportunities?

- US DoE, ONR, NSF, Industry (Tektronix, Keysight, etc.)

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# Generalized Spectral Clustering via Gromov-Wasserstein Learning

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Abstract: We improve upon existing methods for network alignment and community detection using ideas from the mathematical fields of optimal transport and spectral theory. Our new method has strong theoretical justification, allows for multiscale comparisons and provides state-of-the-art performance on benchmark datasets.
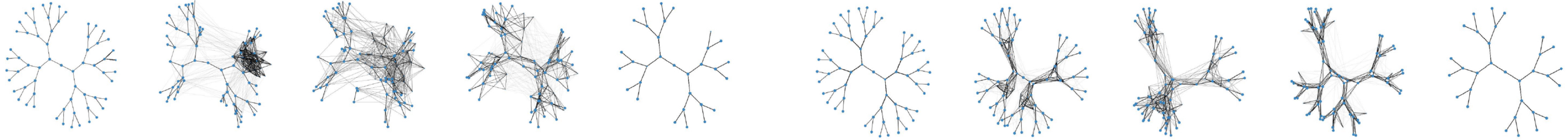
Figure 1: Graph interpolations based on our computational framework. The left depicts an interpolation based on representing a graph by its node adjacency structure. The right depicts an interpolation based on representing the graphs via their heat kernels. We observe that the heat kernel representations provide an interpolation which better reflects large scale graph structure.

Network Matching

Networks encode relational data between objects; for example, gene interaction networks and social networks. When comparing two networks, one must match nodes between the networks in a manner which best reflects their internal relational structures.

Gromov-Wasserstein distance provides a probabilistic matching between nodes which minimizes distortion of these relational structures.
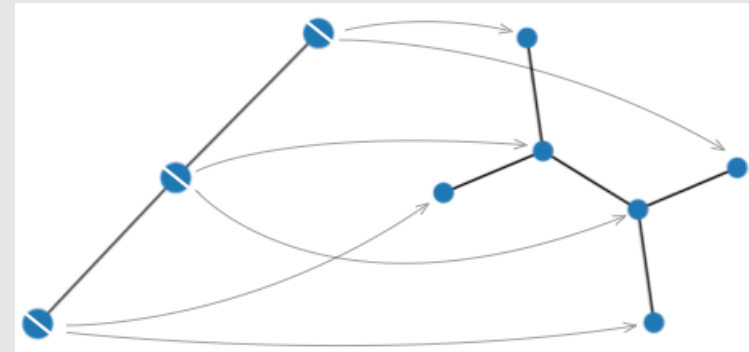
We represent each network in the form *(X,p)*, where *X* is the **adjacency matrix** for the graph and *p* is a probability distribution on the nodes of the graph. A **coupling** of probability distributions *p* and *q* is a joint distribution *C* with marginals *p* and *q*. The Gromov-Wasserstein distance between networks *(X,p)* and *(Y,q)* minimizes the **distortion** over couplings:

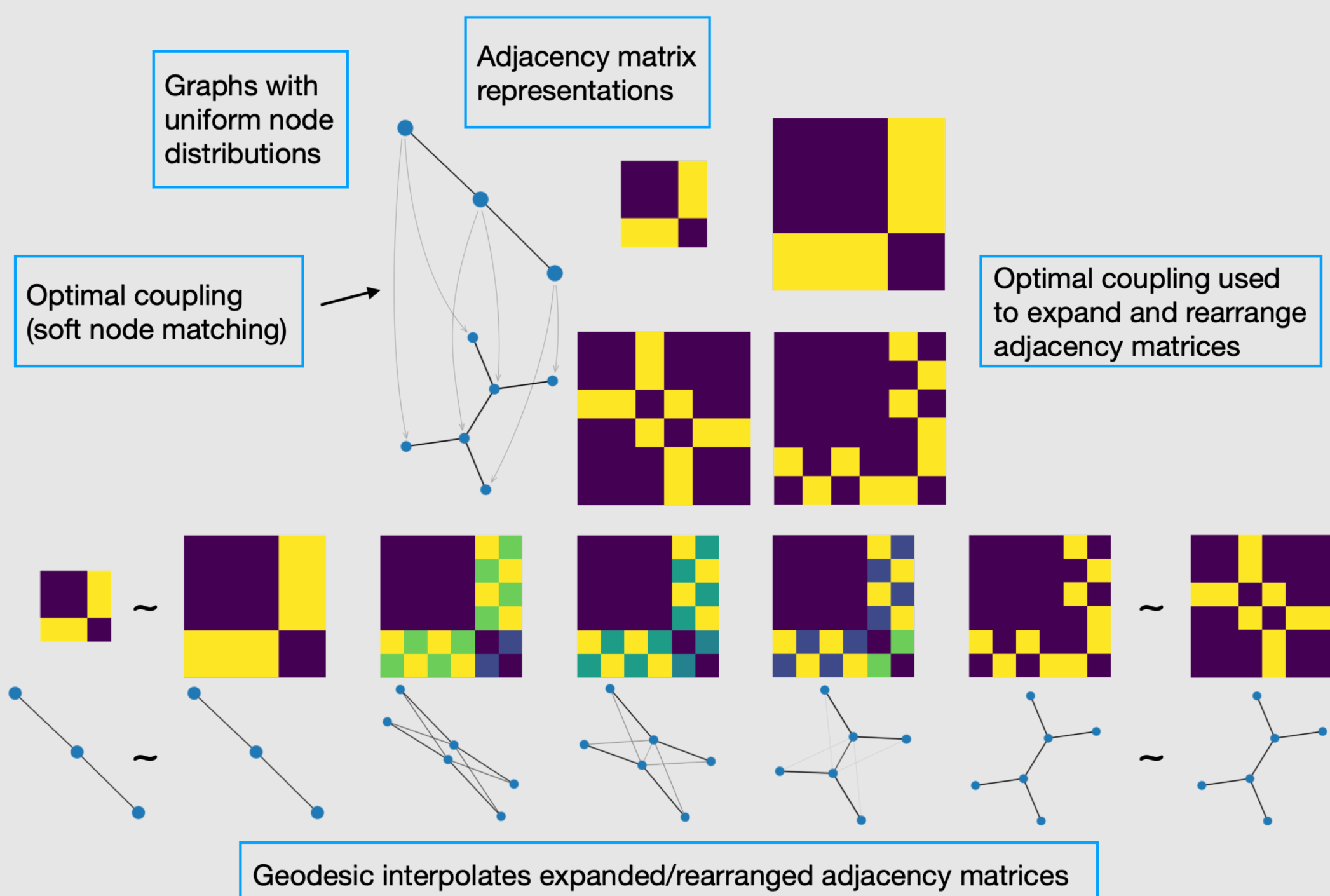$$C \mapsto \sum_{i,j,k,l} \left(X_{ik} - Y_{jl} \right)^2 C_{ij} C_{kl}$$

Heat Kernels

While GW distance has previously compared networks through their adjacency data, we propose comparison of their heat kernels. The **heat kernel** of a graph describes how heat is exchanged between nodes over time *t*. Due to connections to spectral geometry, we call the resulting metric **Spectral Gromov-Wasserstein** distance.

| Graph | Adjacency | Laplacian | Heat Kernel $t = 1$ | Heat Kernel $t = 20$ |

Network Interpolation

The GW framework can be used to define an algorithm to interpolate between graphs, providing a visualization of graph similarity. The algorithm is based on work of K. T. Sturm and is summarized below. It applies to any graph representation. We found that spectral graph representations provide interpolations which better reflect large scale graph structure (Fig. 1).

Graphs with uniform node distributions

Adjacency matrix representations

Optimal coupling (soft node matching)

Optimal coupling used to expand and rearrange adjacency matrices

Geodesic interpolates expanded/rearranged adjacency matrices

Community Detection

Network partitioning is an unsupervised learning task used for community detection. The goal is to divide the graph into some chosen number of communities such that there are few inter-community and many intra-community connections. Xu et al. propose a network partitioning algorithm based on GW distance and achieve state-of-the-art results. We extend this work to perform network partitioning via heat kernel (rather than adjacency) matching.
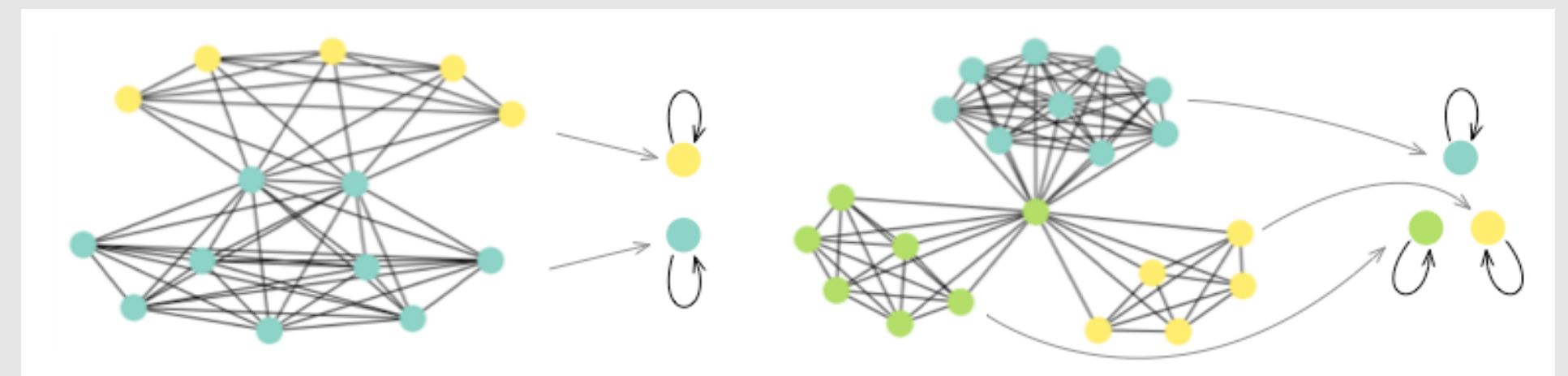
Theoretical Results

Matchings based on spectral graph representations are provably sparse. This means that a node in the source network is not generally probabilistically assigned to many nodes in the target network; this property is favorable for network interpolation and averaging.

Theorem. The number of nonzero entries of a Spectral GW network matching grows linearly in the number of nodes in the networks.

We propose a variant of the Xu et al. partitioning algorithm based on spectral graph representations. In this setting we are able to demonstrate theoretical connections to classical algorithms.

Theorem. Spectral GW network bi-partitioning agrees with classical Fiedler bi-partitioning at sufficiently large time scales.

Future Work: Generalize this result to relate our method to more sophisticated spectral methods and obtain performance guarantees on random graph models

Quantitative Results

Our Spectral GW partitioning algorithm achieves state-of-the-art results on benchmark datasets. Adjusted Mutual Information scores with respect to ground truth communities reported below.

Dataset		Fluid	FastGreedy	Louvain	Infomap	GWL	SpecGWL
Wikipedia	sym, raw	—	0.382	0.377	0.332	0.312	**0.442***
	sym, noisy	—	0.341	0.329	0.329	0.285	**0.395**
	asym, raw	—	—	—	0.332	0.178	**0.376**
	asym, noisy	—	—	—	**0.329**	0.170	0.307
EU-email	sym, raw	—	0.312	0.447	0.374	0.451	**0.487**
	sym, noisy	—	0.251	0.382	0.379	0.404	**0.425**
	asym, raw	—	—	—	**0.443**	0.420	0.437
	asym, noisy	—	—	—	0.356	**0.422**	0.377
Amazon	raw	—	0.637	0.622	**0.940**	0.443*	0.692
	noisy	0.347	0.573	**0.584**	0.463	0.352	0.441
Village	raw	—	**0.881**	**0.881**	**0.881**	0.606*	**0.801***
	noisy	—	0.778	**0.827**	0.190	0.560	0.758

*Slight improvements possible with proximal gradient, but overall performance rankings are preserved.

References

1. S. Chowdhury and T. Needham, *Generalized Spectral Clustering Via Gromov-Wasserstein Learning.* ArXiv:2006.04163.
2. S. Chowdhury and T. Needham, *Gromov-Wasserstein Averaging in a Riemannian Framework.* In: Workshop Proceedings of CVPR 2020.
3. S. Chowdhury and T. Needham. *Spectral-Gromov-Wasserstein Code Repository.* github.com/trneedham/spectral-gromov-Wasserstein.
4. K. T. Sturm, *The space of spaces: curvature bounds and gradient flows in the space of metric measure spaces.* ArXiv:1208.0434.
5. H. Xu, D. Luo and L. Carin, *Scalable Gromov-Wasserstein Learning for Graph Partitioning and Matching.* In: Proceedings of NeurIPS 2019.

Unraveling the Contextual Effects on Interracial Crime Reporting

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Research Background

- A great deal of research has focused on the legacy of lynching as an important predictor of racial animus and hostility toward Blacks in contemporary America (e.g., Messner et al. 2005; Porter 2011). For example, previous research has found relationships between past lynching and violence against Blacks, contemporary capital punishment, and prison admissions.

- A limited number of studies have examined the impact of contextual characteristics on traditional crime reporting (Xie and Lauritsen 2012).

- The objective of this research is to examine the effects of the contextual characteristics on interracial crime reporting, with a particular focus on the legacy of White and Black lynching.

- Racial threat hypothesis suggests greater interracial crime reporting in areas with greater legacies of lynching.

Data and Methods

- *Data:* the National Crime Victimization Survey Metropolitan Statistical Area (NCVS MSA) files linked with Tolney and Beck's inventory of Southern lynch victims and the contextual level data from the Census Bureau, the American Community Survey, the Uniform Crime Reports, and other sources.
- *Dependent variable:* victim reporting (victim called the police; coded 1 = yes, 0 = no)
- *Independent variables:*
  - Interracial crime: Black offender–White victim (BO–WV); White offender–White victim (WO–BV)
  - White Lynching (1865–present)
  - Black Lynching (1865–present)
- *Control variables* (indicators of racial context, crime settings, crime seriousness, victim and offender characteristics, and MSA conditions).
- Survey logistic regression models.

Metropolitan Areas included in the NCVS MSA
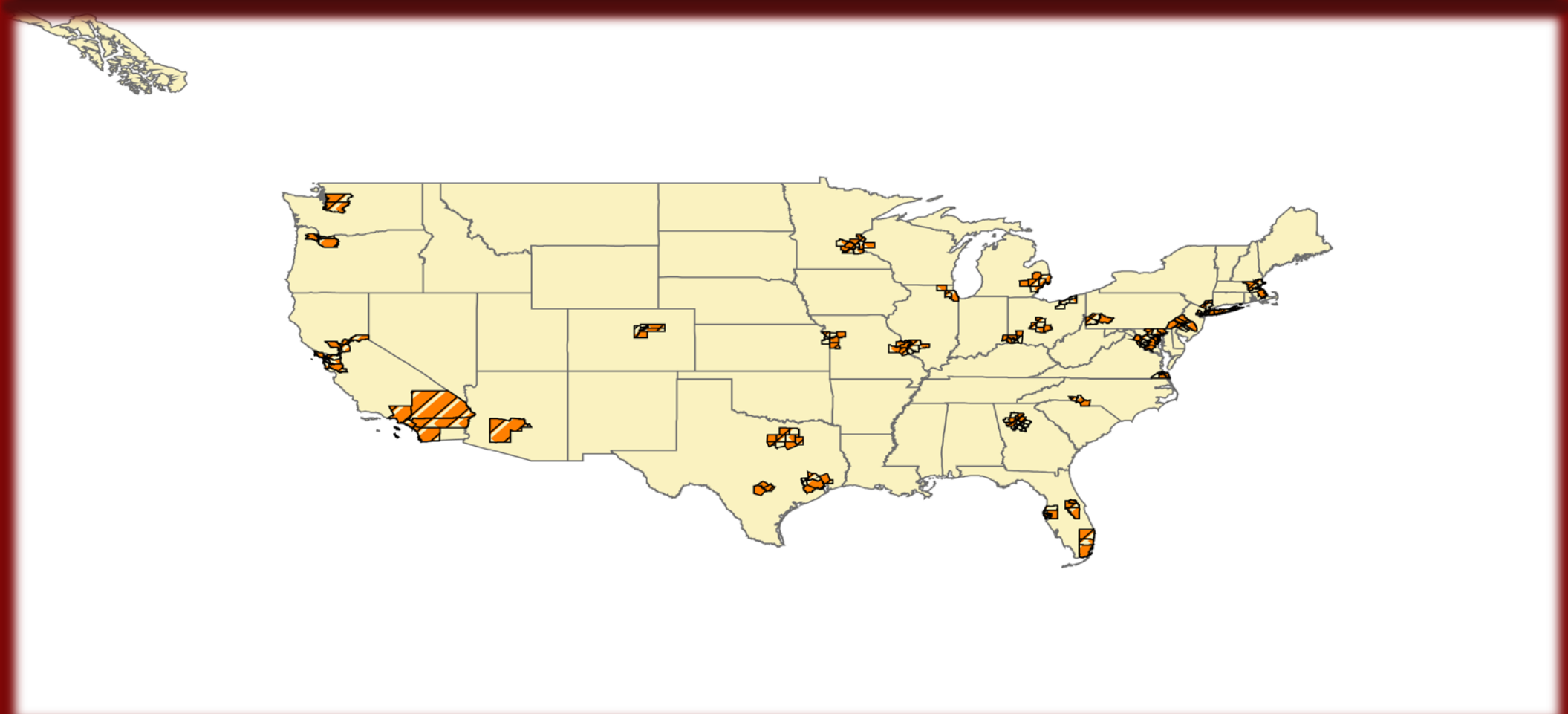
Results

	Model 1	Model 2	Model 3	Model 4
Black Lynching* BO-WV	.014* (.008)			
Black Lynching* WO-BV		-.015 (.037)		
White Lynching* BO-WV			.076* (.042)	
White Lynching* WO-BV				-.221 (.185)
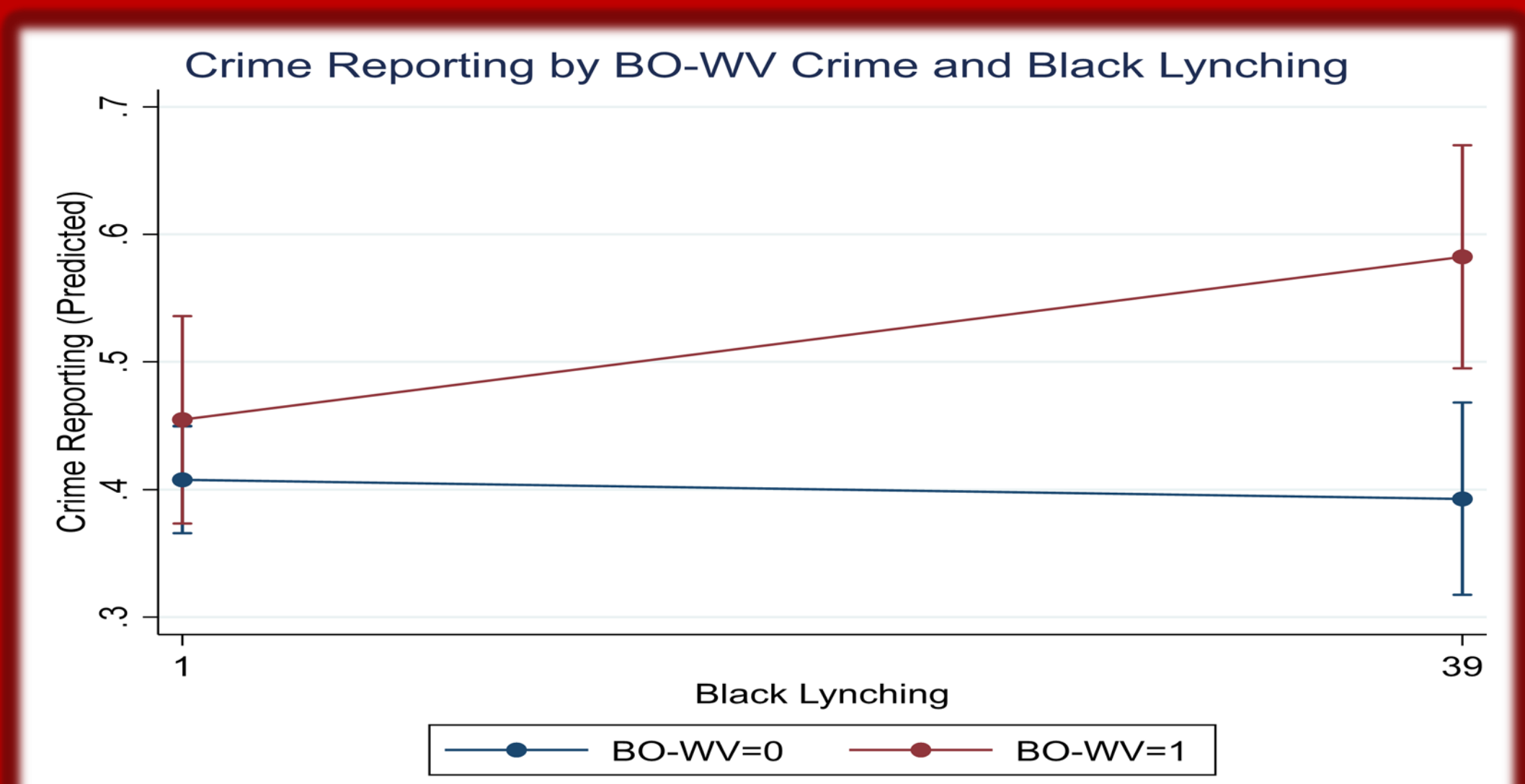
Conclusion

- The positive effect of interracial crime, where the offender is Black and the victim is White, on crime reporting is enhanced in MSAs with greater legacies of Black and White lynching
- There were no effects for interracial crime where the offender is White and the victim is Black.
- Additional results revealed no effects for intraracial crimes (White offender and White victim or Black offender and Black victim).
- Support for the racial threat theory
- Past lynchings might affect contemporary reporting as a type of self-help through reduced social control.

Future Research

- Examine the effects of the contextual characteristics on hate crime victimization and reporting
- Explore the links between the legacy of lynching and hate crime victimization and reporting
- Contact info: Sylwia Piatkowska
  Email: spiatkowska@fsu.edu

Visualizing Water and Power: Documenting racial capitalism in post-bankruptcy Detroit, Michigan and San Juan, Puerto Rico through film and story

- Racial Capitalism undermines financial and ecological recovery efforts in Puerto Rico

- The privatization of the public electric authority in Puerto Rico (PREPA) dampens efforts to transfer the island's grid to renewable energy; increases financial and environmental costs for residents

- Opportunity Zone capital gains tax policy spurs working class displacement at a time of heightened vulnerability

- Documentary film is an effective form knowledge production and dissemination

New Fortress Energy Founder and CEO Wes Edens Rings the Nasdaq Stock Market Opening Bell (Nasdaq, Inc.)
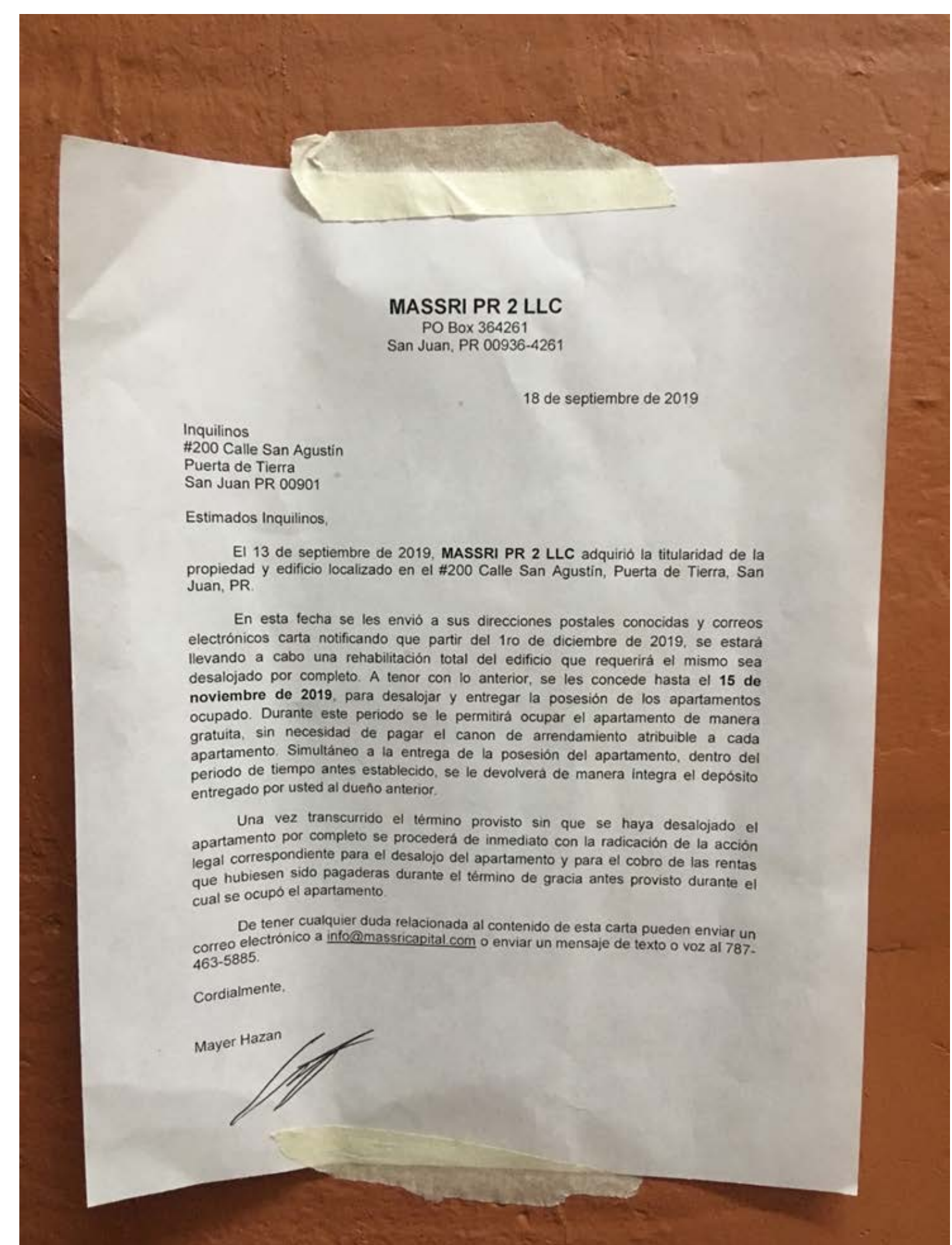
Output so far includes a journal manuscript, *"Cuando Colón baje el dedo": infrastructural repair and social reproduction in the time of financialization,* and a documentary film of the same name, currently in scriptwriting and editing.

Contact info:

Sage Ponder - Geography

csponder@fsu.edu

Reconstructing Schemata for Historical Piano Improvisation, 1800–1830

Gilad Rabinovitch, FSU College of Music (Music Theory)

Background

We associate classical music with strict adherence to musical scores: classical musicians perform historical European pieces in this way today. Historical practices were extremely different: European musicians from the middle ages (Busse Berger 2005) to the eighteenth (Gjerdingen 2007, Sanguinetti 2012) and early nineteenth centuries (Gooley 2018) acquired musical skills through improvisation and often improvised in performance. Can we even hope to reimagine or reconstruct the inaccessible sounds of historical European improvisation?

Method

The article manuscript produced during the FYAP period focuses on Carl Czerny's 1829 treatise, *Systematische Anleitung zum Fantasieren auf dem Pianoforte* (*A Systematic Introduction to Improvisation on the Piano*). This unique source contains a wealth of musical notations that represent some of the improvisatory practices of the time. Czerny's descriptions are uncannily similar to accounts of improvised performances in the period itself and to notated fantasies (Bartoli and Roudet 2013, Gooley 2018).

Musical schema theory (Gjerdingen 1988, 2007, Byros 2012) seeks to describe implicit knowledge of musicians and listeners through a detailed analysis of musical structure.

Main Findings

The analysis of Czerny's treatise with schema-theoretical tools has led me to the following conclusions:

1) Two musical structures described explicitly by modern-day music theorists, the *sentence phrase type* (a type of AAB pattern, Caplin 1998) and the *changing-note schema* (a melodic pattern, Gjerdingen 1988) emerge as implicit formulas in Czerny's musical notations, which demonstrate how to improvise.

2) Czerny's list of recommended fantasies for emulation in live improvisation reveals some of his historical listening horizons. His list suggests a concrete beginning-of-improvisation prototype, whose features I describe in detail in my article. This opening pattern sheds new light on well-known classical pieces, including Beethoven's Appassionata piano sonata. (In fact, Beethoven's works were often perceived as improvisatory and bizarre by his contemporaries.)

My work therefore reconstructs concrete patterns of improvisation, contributing significantly to scholars' and practitioners' reimagining of historical practices. The project includes both theoretical findings and creative parts—you can learn more about the creative parts on the right-hand column of this poster.

Publication Plans
I have an article manuscript close to completion, which I will submit for initial review with a music theory journal by August 31st, 2020.

Plans to Obtain Outside Funding
I am exploring opportunities for outside funding in the humanities to expand my research on reimagining and reconstructing classical improvisation.

Contact: grabinovitch@fsu.edu

What may it have *SOUNDED* like?

Johann Nepomuk Hummel's Fantasy Op. 18 was considered by early nineteenth-century critics to be a model for live improvisation. You can listen to its introduction and first movement by following this link (accessible with FSU credentials):

https://fsu-naxosmusiclibrary-com.proxy.lib.fsu.edu/stream.asp?s=56370%2Ffsunmlpaid15%2F557836%5F06

The following link includes sound recordings of the creative parts of my project:

https://fsu-my.sharepoint.com/:f:/g/personal/grabinovitch_fsu_edu/EtZdW0jacBdBvkxmbleWzaUBWukU9OsRue9pywyqcfzNPg?e=sOqYaX

The first four files are the four movements of a fantasy that I composed, based on 3 brief phrases from Czerny's treatise. Reconstructing a fantasy based on Czerny's fragments is a bit like trying to reconstruct dinosaurs, though my project is of course more speculative and creative.

The last file on the OneDrive folder is a live improvisation. From COVID-19 distancing, I conducted a Zoom session with several professional colleagues in which they gave me suggestions for improvisation. In this file, I first repeat the audience suggestion, then improvise a slow movement in the style of Frédéric Chopin.

Carl Czerny (1791–1857)

To the left: Érard piano built in 1791, the year of Czerny's birth, now housed at the Musée de la musique, Paris. Pianos in the nineteenth century were far less standardized than in modern-day concert halls. One of the functions of improvised introductions in the early nineteenth century was to test out an unfamiliar instrument (Hamilton 2008). In our time, a pianist entering a concert hall with a Steinway D model can expect very few surprises in terms of touch, mechanics, and sound.

VIRAL INNOCENCE
Ryan White and AIDS

- This book project explores the life and legacy of Ryan White, a teenage hemophiliac who contracted HIV through contaminated blood products. White became a household name in 1985 after he was barred from attending his middle school in suburban Kokomo, Indiana.
- National media coverage of Ryan's story, especially the efforts of his family and his attorneys to affirm the boy's right to attend school, served to complicate prevailing conceptions of HIV/AIDS.
- Yet by distinguishing White from those within the gay community, media accounts hardened the binary between "innocent" and "guilty" individuals living with HIV/AIDS, thereby reinforcing the stigmas surrounding men who had sex with other men— as well as the intravenous drug users who were also particularly susceptible to exposure.

- Employing a wide array of archival, newspaper, oral history, and televisual materials, *Viral Innocence* addresses vital questions concerning "innocence," "guilt," and "victimhood" within the Ryan White saga and the 1980s and 1990s AIDS crisis, more broadly.
- *Viral Innocence* will be published by a major university press— hopefully in spring or summer 2025 to coincide with the fortieth anniversary of Ryan White's saga, which began in earnest in July 1985, or the thirty-fifth anniversary of his death in April 1990.

Paul M. Renfro
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Stability of odor-evoked activity in defined cell populations in the mouse olfactory bulb

Narayan Subramanian[1], Douglas A. Storace[1,2]

1: Department of Biological Science, Florida State University, Tallahassee, FL 32306

Background: The olfactory bulb has dense expression of metabolic-related receptors (e.g., insulin, cannabinoid, leptin, ghrelin).

Metabolic-related receptors are expressed throughout these layers.

ob, olfactory bulb
oe, olfactory epithelium
onl, olfactory nerve layer
gl, glomerular layer
epl, external plexiform layer
mcl, mitral cell layer
gcl, granule cell layer

Labeled nerve terminals from epithelium (input)

Projections out of bulb

Feedback from rest of brain

Question: Do metabolic changes (e.g., fasting or obesity) modulate neural activity in this brain area?

Problem 1: Identifying and recording from these cells across time periods required for metabolic changes.

Problem 2: Determining whether responses are stable across time under normal conditions such that metabolic-induced changes can be detected.

Approach: Generate transgenic mice that have fluorescent protein sensors of neural activity in different cell types.

Labeled nerve terminals from epithelium (input)

OMP-tTA :: tetO-GCaMP6s

Low magnification   High magnification
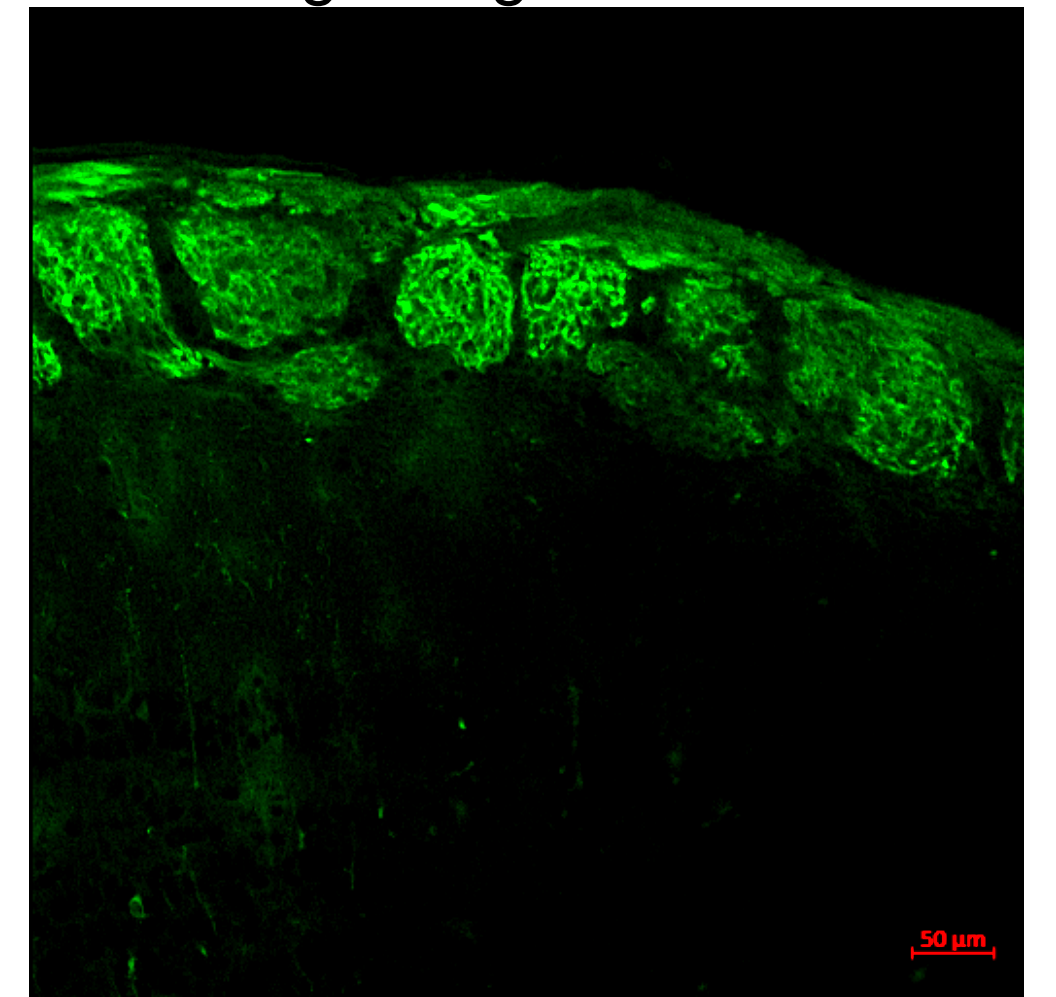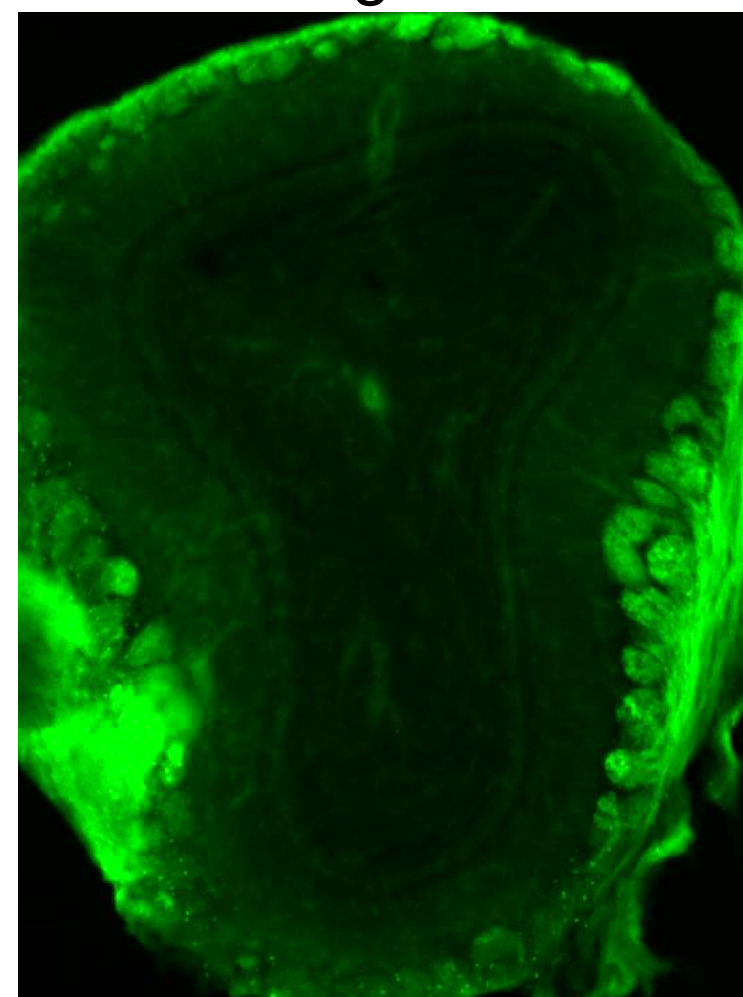
Projections out of bulb (output)

Low magnification   High magnification

Tbx21-Cre :: Ai148
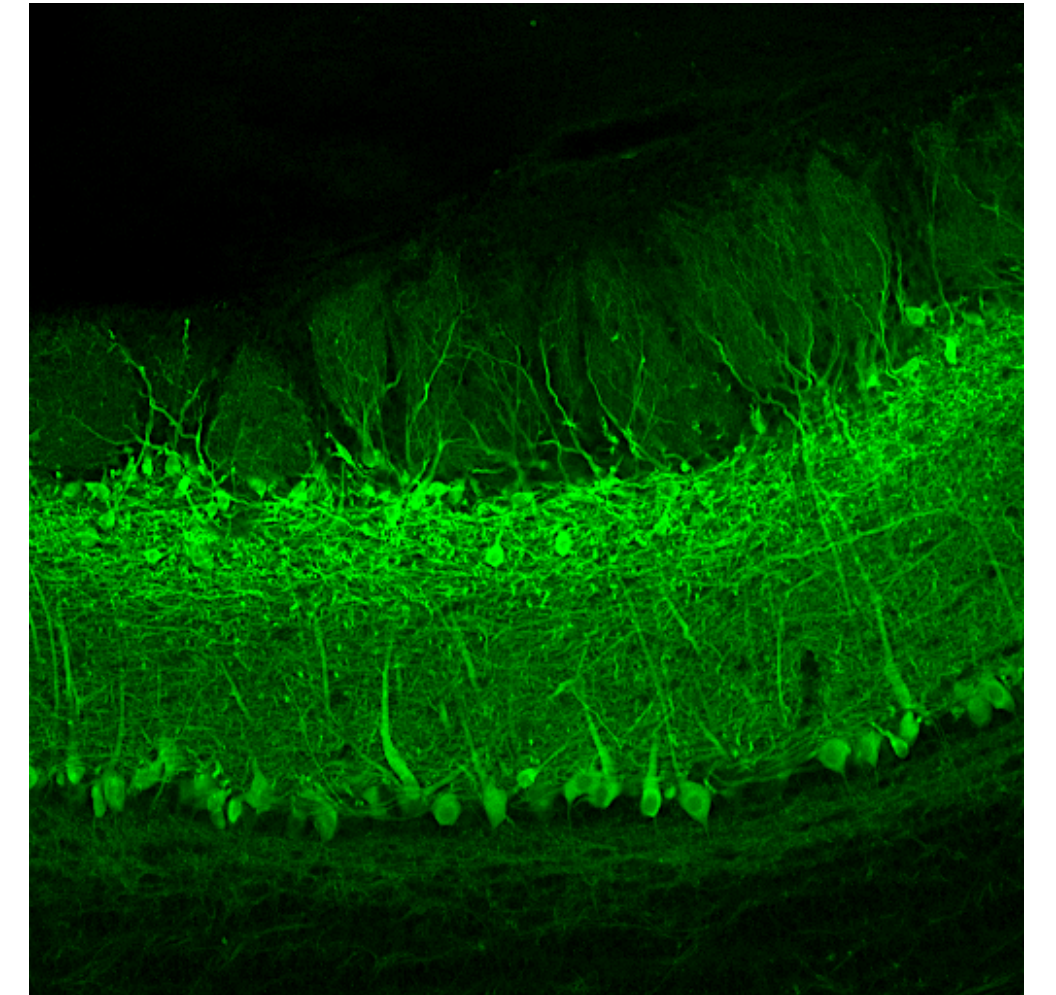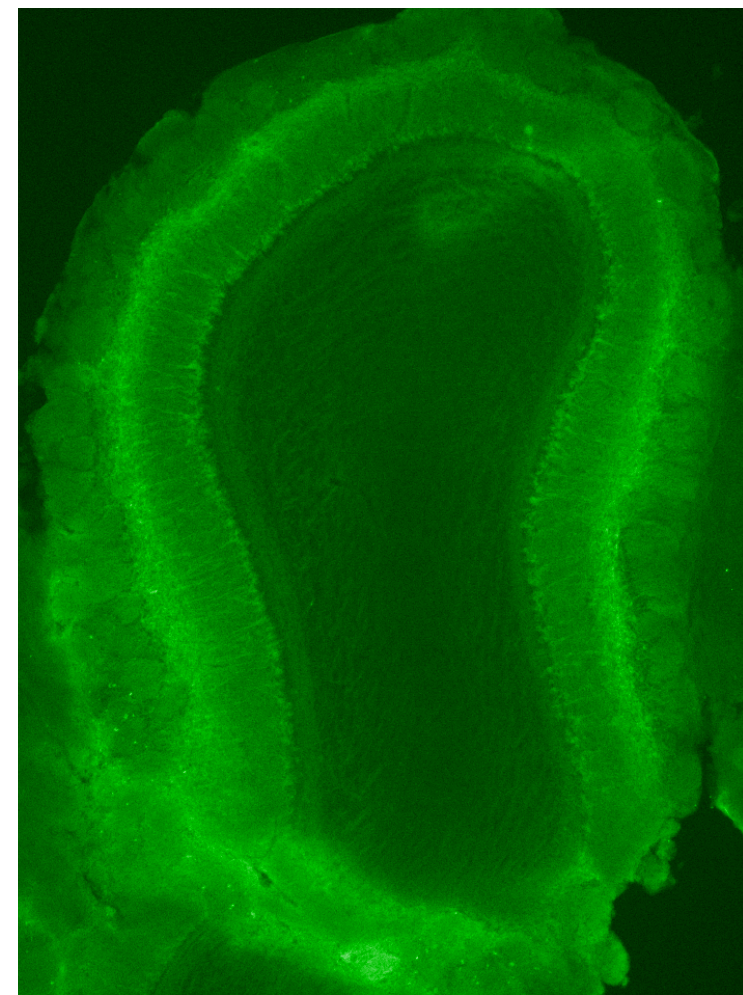
Result: Epifluorescence or 2-photon imaging can be used to identify and record from the same neurons across weeks.

In vivo images from the olfactory bulb from the two different transgenic mice. Imaging was carried out across several weeks. The same neurons could be identified (the red arrows indicate some examples).

Input

Imaging plane

Input (epifluorescence imaging)

Day 1   Day 31

Output

Imaging plane
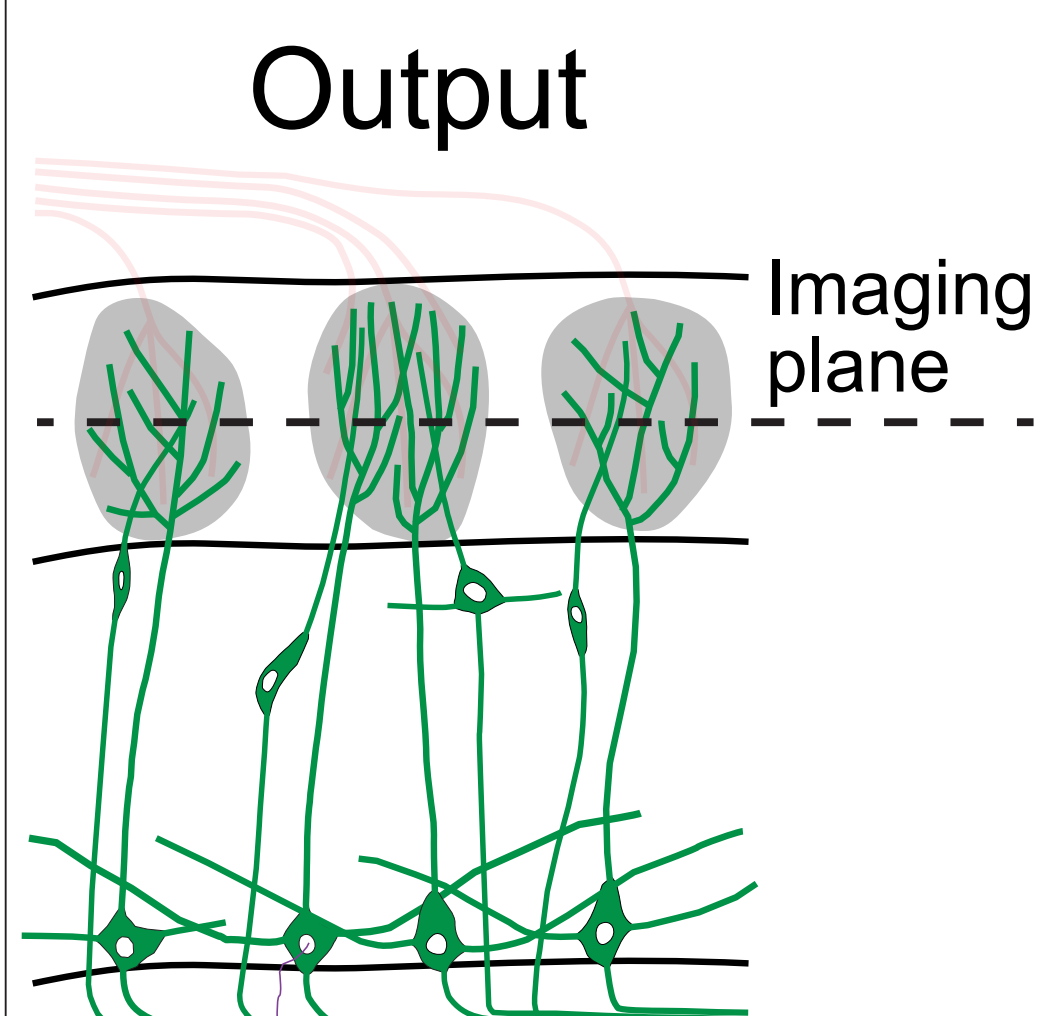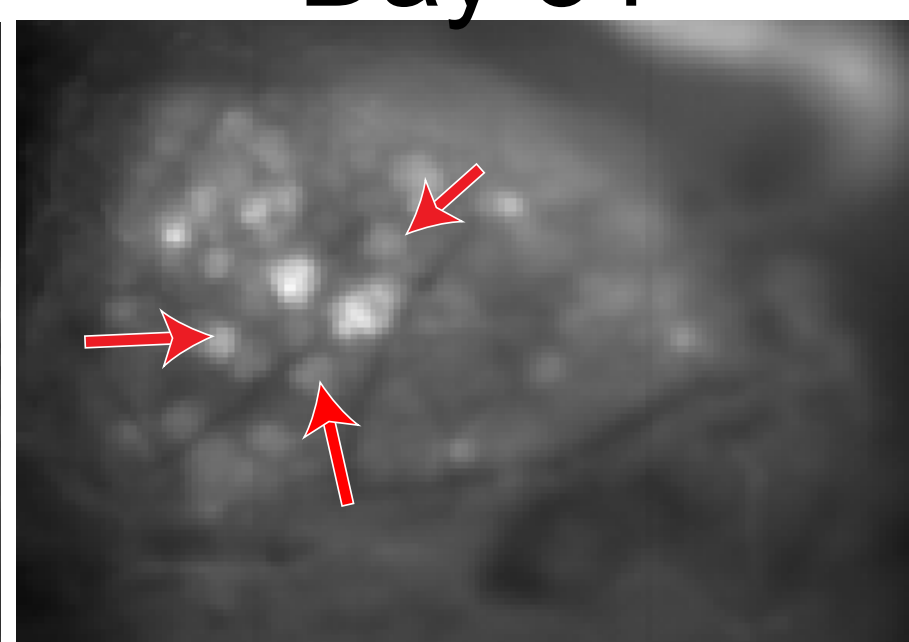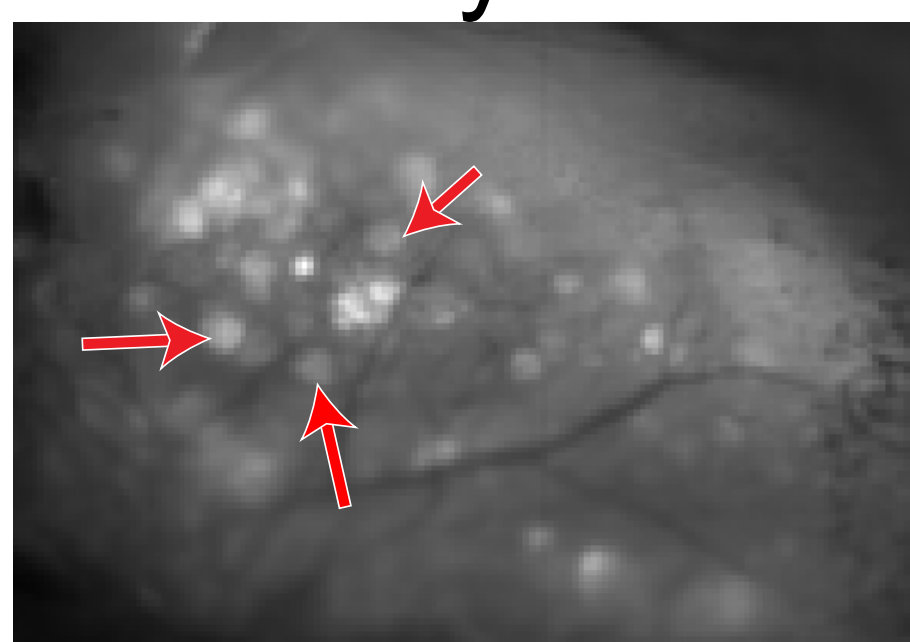
Output (2-photon imaging)

Day 11   Day 30

Result: Functional responses are relatively stable across time

Odor-evoked activity from bulb input across 7 days (normalized to day 1)

Each line is a different preparation expressing the sensor in the bulb input
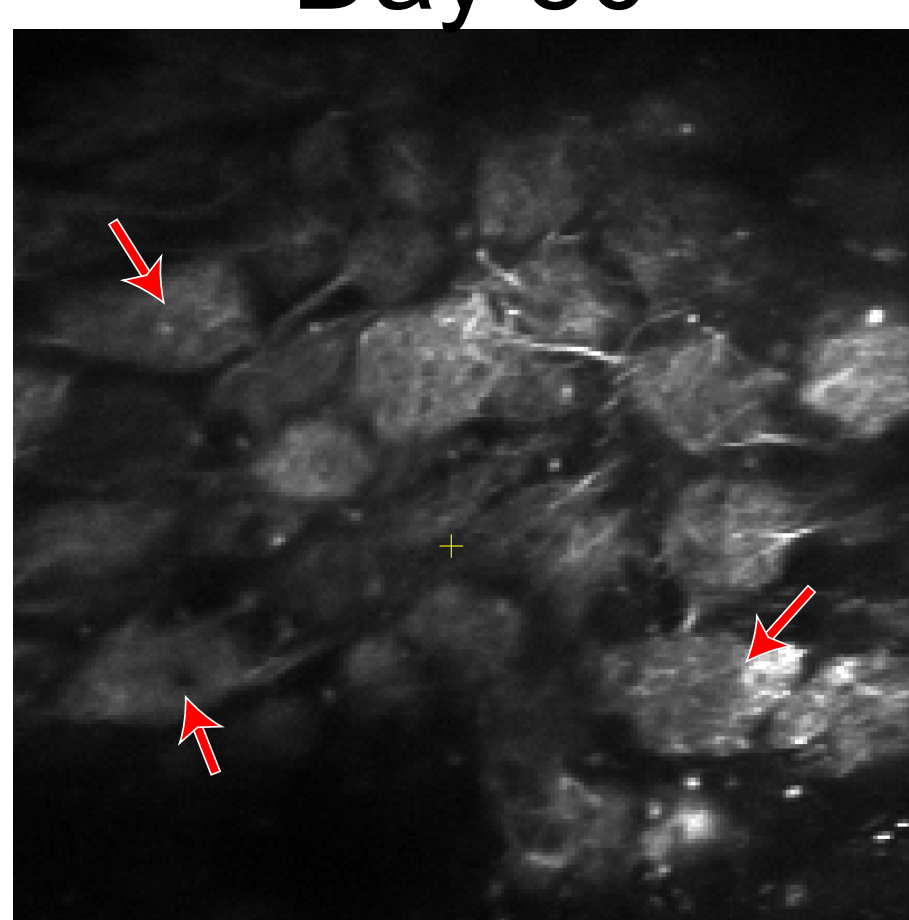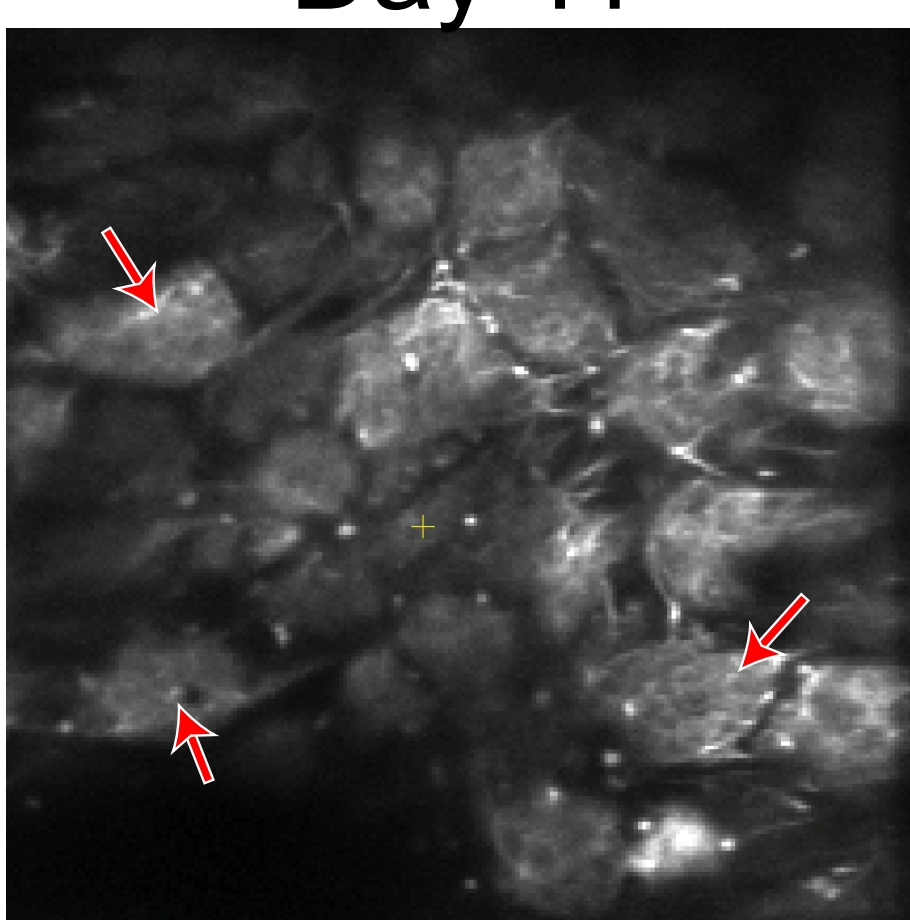
Conclusions

Our imaging strategy can reliably identify and track the same populations of neurons across weeks.

Functional recordings from bulb input are relatively stable. This is important if we want to assess long-term changes in brain activity.

Current experiments are assessing the functional stability of recordings from the bulb output. We are also examining how making mice obese or fasting them impacts neural responses to odor stimuli.

Exploring the N=28 shell gap by probing excited states in exotic Cl, P isotopes

Vandana Tripathi

Department of Physics, Florida State University, Tallahassee, Fl 32306

The Atomic Nucleus:

→ Contains protons (+ive charge) and neutrons (neutral)
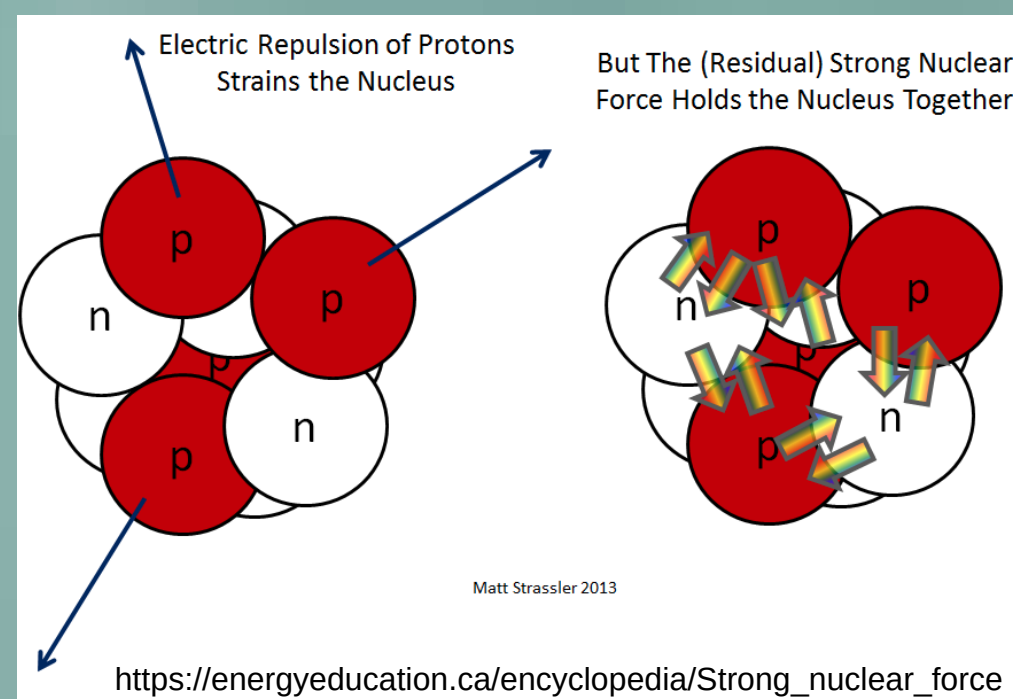
→ size, r~10^{-15} m

→ What holds these nucleons together despite the Coulomb repulsion of protons? Ans: The "strong Nuclear Force".

→ However, the task of describing the Nuclear Force quantitatively has been challenging so far.

Electric Repulsion of Protons Strains the Nucleus

But The (Residual) Strong Nuclear Force Holds the Nucleus Together

Matt Strassler 2013

https://energyeducation.ca/encyclopedia/Strong_nuclear_force

→ Experimental observation of nuclear properties have guided the understanding of the nuclear force largely, e.g. scattering experiments, the binding energy of light nuclei and excited states in nuclei.

→ The investigation of excited states in very exotic isotopes of Cl, P with neutron number close to 28 is the focus of this study.

→ The motivation is to understand the N=28 shell gap at large asymmetry of neutron and proton away from stability and the variation of the residual nuclear force when moving away from the valley of beta stability.

## Experiment at the NSCL (Dec 2019):

(P.I. Vandana Tripathi)

The National Superconducting Cyclotron Laboratory (NSCL) is a world leader in rare isotope research located on the campus of Michigan State University. Rare isotopes are produced by "Projectile Fragmentation" in which very high-energy heavy ions are broken into exotic residues which are used for beta-decay studies as well for secondary reactions. The experiment e18016 was performed at the Decay Station using fragmentation of ^{48}Ca
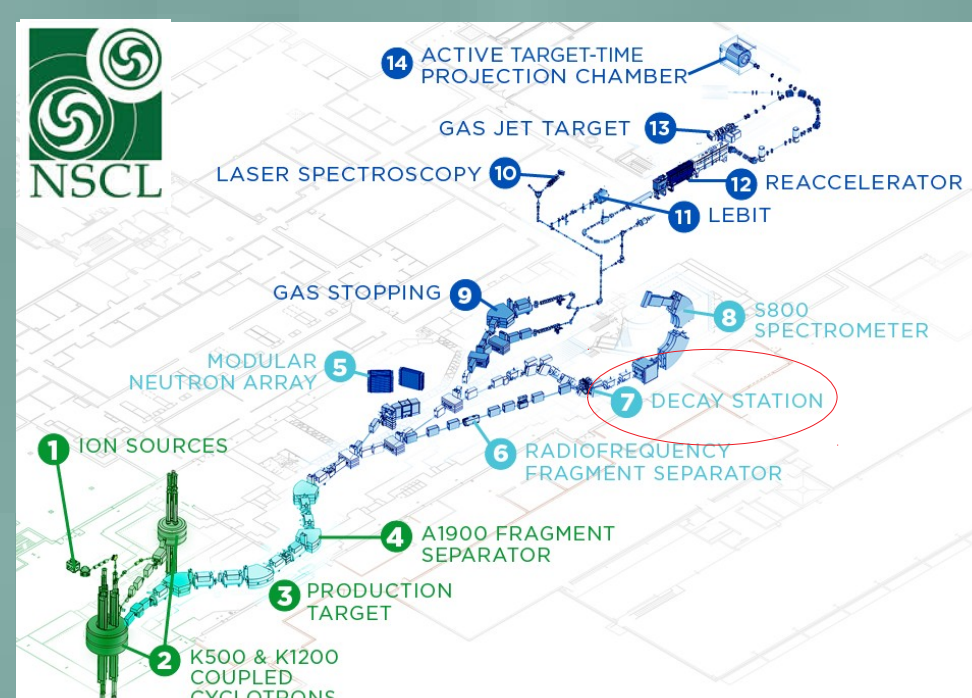
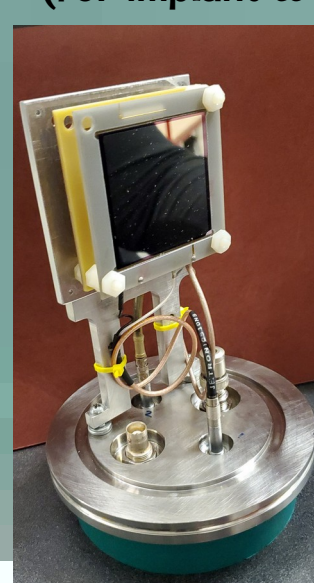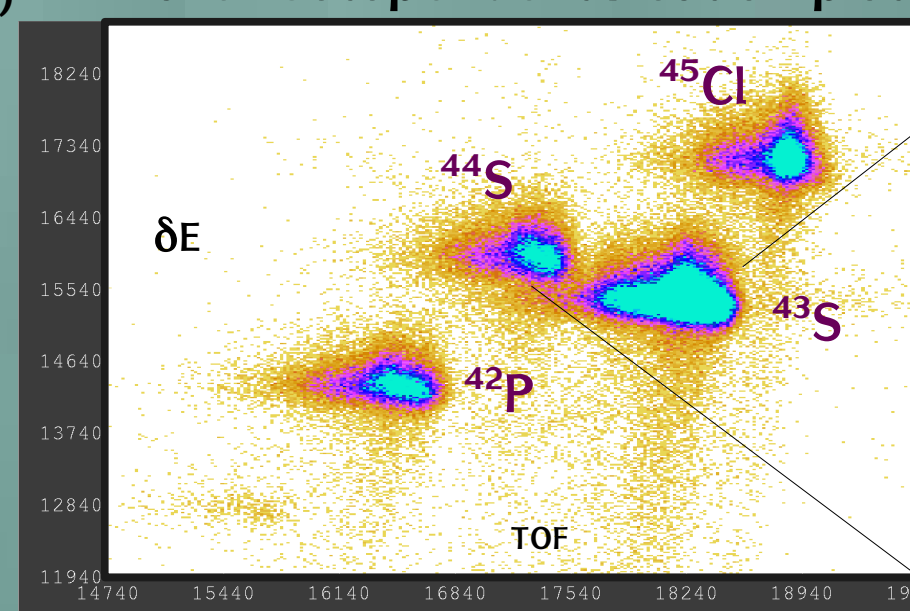### β-decay at the Decay Station

16 CLOVER detectors (for γ-rays)
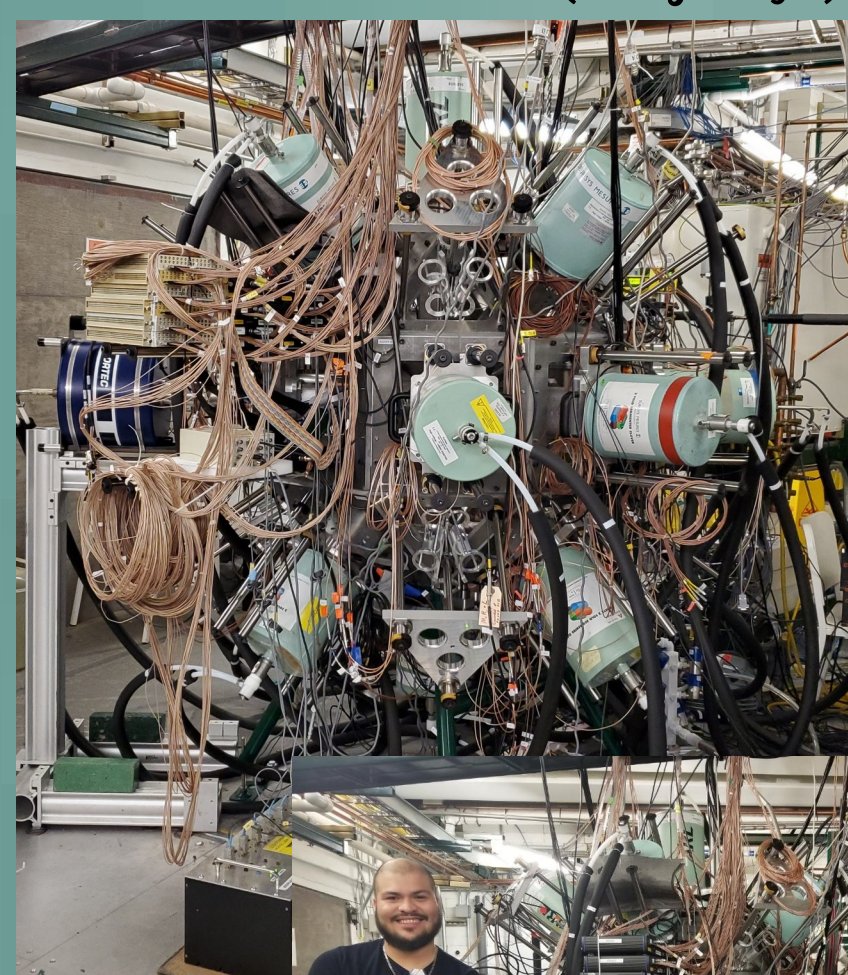
40x40 DSSD (for implant & β)

Rare-isotope identification plot

^{40}Ca (140MeV/u) fragmentation

(1) → ^{43,44}S   (2) → ^{45,46}S

→ understanding the N=28 shell closure
→ β-decay of $^{43-46}$S
→ study excited states in Z=16,17,18 with N~28 isotopes
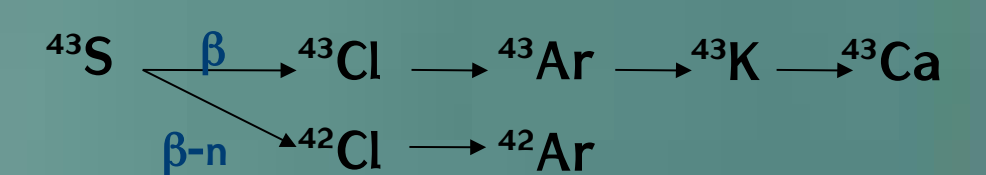→ Intruder states with firm J^{π}

Left to right:
Jesus Perello and Vandana Tripathi (FSU)
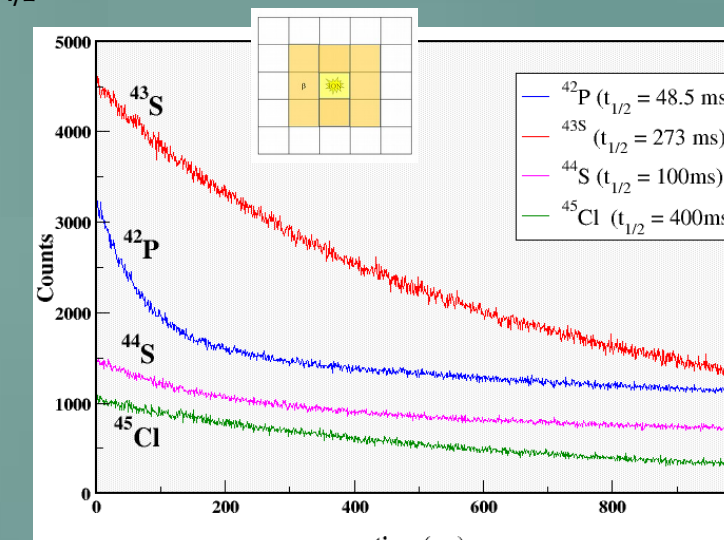Aaron Chestor, Andrea Rickard and Katie Childers (MSU)
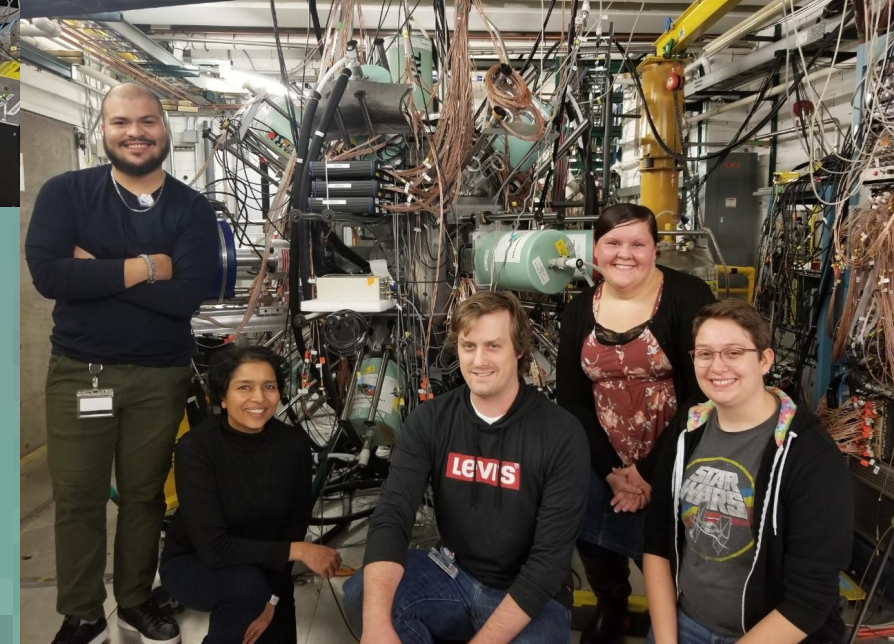
Current Status and Future Directions:

• Preliminary analysis of part 1 of the data has revealed several new states in ^{43}Cl, ^{44}Cl, and ^{42}S (some the very first !)
• In comparison the stable isotopes found in nature are ^{35,37}Cl and ^{32}S where information is already available.
• Next step is to infer the spin/parity of these states which requires extracting the intensities and branching ratios.
• Part 2 of the data to be analyzed now, will reveal information in even more exotic (larger neutron excess) nuclei.
• Further, comparison of this data with state-of-the-art shell model calculations will benchmark the calculations.
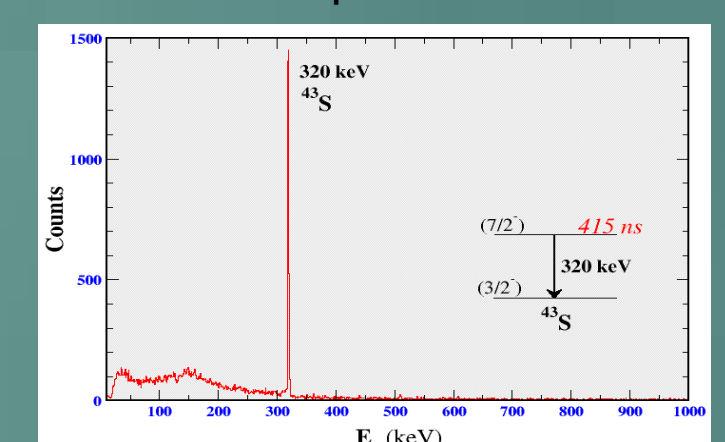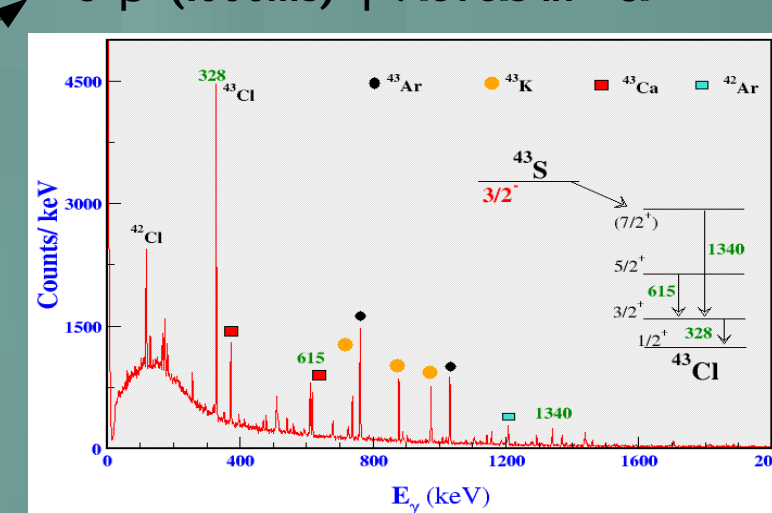• This will pave the path for the study of even more exotic nuclei .

Exotic Nuclei
→ Far From the Valley of Beta Stability:

In the past few decades, the study of nuclei far from the stability line has become a rapidly growing research area owing to continuously developing radioactive beam techniques. New decay modes were discovered in rare isotopes with extreme proton-to-neutron ratio such as β-delayed particle emission and direct particle emission processes. Investigations on these decay modes can provide rich spectroscopic information, such as level energies, spins, parities, and level densities and information on their emission mechanism as well. The comparison between experimental data and theoretical prediction for exotic nuclei can improve our understanding of the structure and behavior of nucleons inside the nucleus.

Preliminary Results:

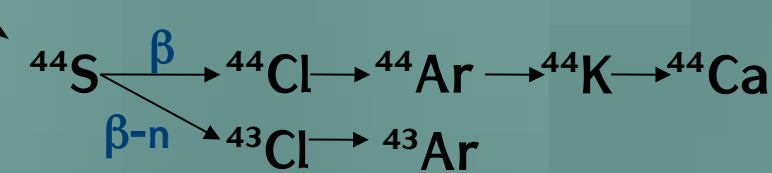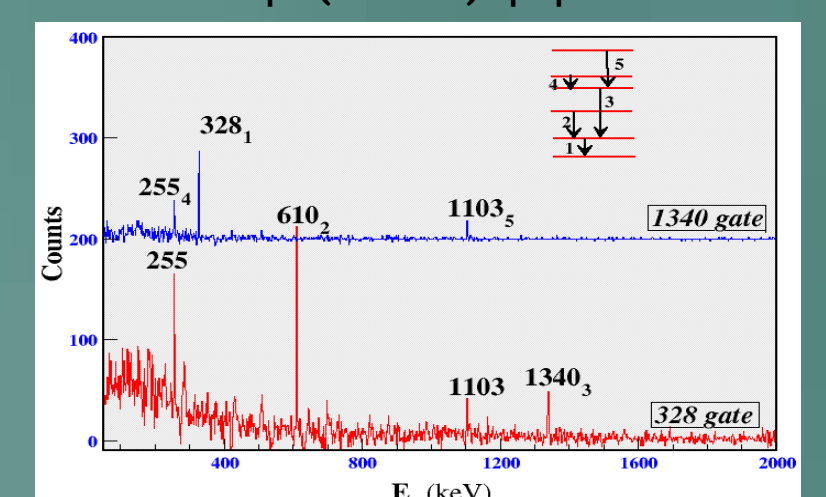Time between implant-β: infered half-life ($t_{1/2}$). (gated on implant,9 pixels, 1000ms)

^{43}S $\xrightarrow{\beta}$ ^{43}Cl $\longrightarrow$ ^{43}Ar $\longrightarrow$ ^{43}K $\longrightarrow$ ^{43}Ca

$\xrightarrow{\beta-n}$ ^{42}Cl $\longrightarrow$ ^{42}Ar

Fragment (^{43}S) – γ coincidence: Isomeric γ transition in ^{43}S

^{43}S-β-(1000ms)-γ : levels in ^{43}Cl

^{43}S-β-(1000ms)-γ-γ

^{44}S $\xrightarrow{\beta}$ ^{44}Cl $\longrightarrow$ ^{44}Ar $\longrightarrow$ ^{44}K $\longrightarrow$ ^{44}Ca

$\xrightarrow{\beta-n}$ ^{43}Cl $\longrightarrow$ ^{43}Ar

^{44}S-β-γ: levels in ^{44}Cl
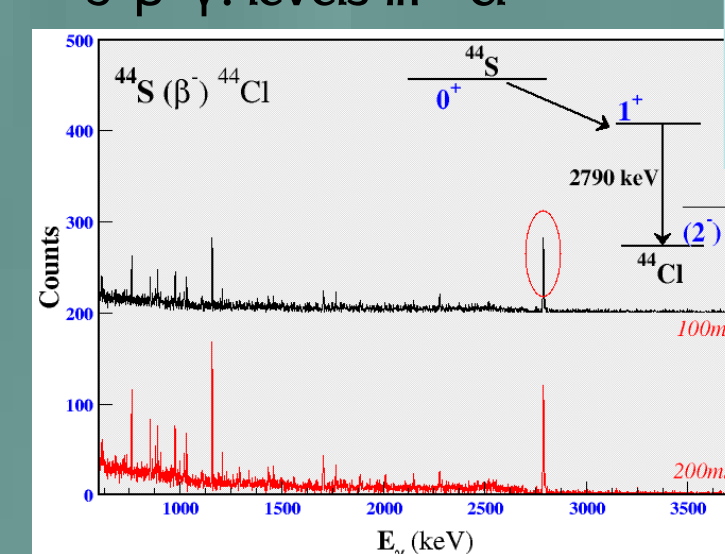
First intruder (or opposite parity) state in ^{44}Cl

TABLE 199. The low-lying spectra for ^{44}S(0^+) → ^{44}Cl(1^+)

parent	Ex. (MeV)	log ft	B(GT)
^{44}S (0^+ g.s.)	2.23	5.76	0.00658
	2.70	5.59	0.00989
	2.92	4.47	0.13007
	3.06	4.43	0.14298
	3.51	4.73	0.07029
	3.66	5.99	0.00394
	4.04	5.79	0.00613
	4.14	6.49	0.00123
	4.29	8.10	0.00003
	4.57	5.06	0.03311

Sota Yoshida et al., SM with SDPF_MU

^{42}P-β-γ: levels in ^{42}S

$T_{1/2}$ = 48.5 ms
$Q_{\beta-}$ = 18.6 MeV

^{42}P $\xrightarrow{\beta}$ ^{42}S $\longrightarrow$ ^{42}Cl $\longrightarrow$ ^{42}Ar

$\xrightarrow{\beta-n}$ ^{41}S $\longrightarrow$ ^{41}Cl

L.G et al., PRC 81,064329 (2010)

g.s: $\pi_{3/2+}$ + $\nu_{3/2-}$
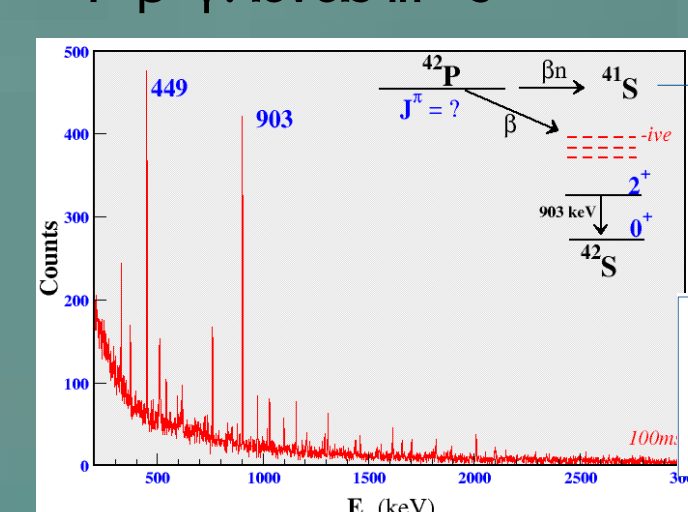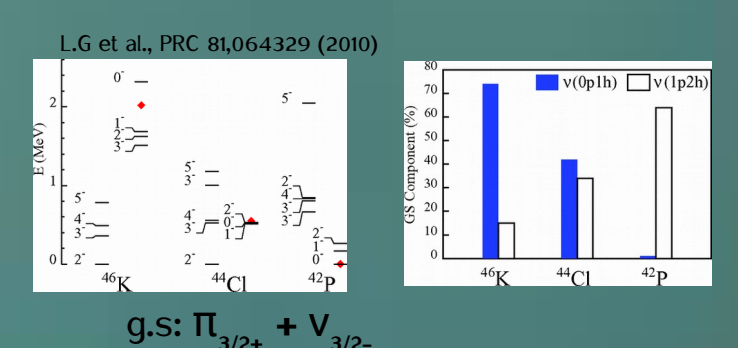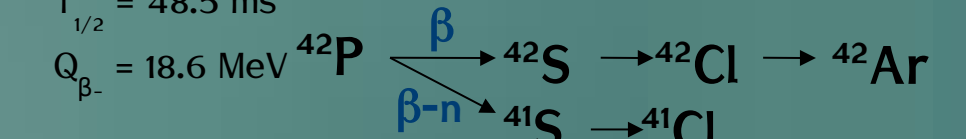
Liliya Ugay

TOWARDS THE BEGINNING AND AFTER THE END

Florida State University College of Music
Department of Music Theory and Composition
Kuersteiner hall, 316B; lugay@fsu.edu

Covid-19 severely impacted live arts, and, in particular, concert music. Composers, performers, and music producers faced the urgency of changing the modes of presentation of their work. The pandemic sharpened the issues of the concert music scene that were prevalent for decades - such as strong dependency on older audience, exclusive focus on Western Canon, lack of diversity, and rather infrequent attempts to create music that is not abstract from the society. Expectedly, presenters of concert music shifted to digitalization. And hence, with different context it is inevitable that the content of the new art music must be re-considered. In the attempt of such change I composed two pieces: *Sleep n Play* for Icarus Quartet and *After the End of Time* for Unheard-Of Ensemble.

In each of these pieces I pursued the goal of breaking of academic norms of "traditional" concert music, but by using different methods. Writing *Sleep n Play* I experimented with theatrical, visual, and narrative aspects, while creating a musical representation of infant's attempts to fall asleep. The ensemble consists of two pianists and two percussionists, which I elaborated for the needs of this piece using: grand piano, toy piano, real percussion instruments and toy percussion instruments. The composition alternates between a tinkling lullaby and unpredictable child's attempts to play. Eventually the desire to play wins, and after outburst of active playtime and excitement the child finally falls asleep. In the music score I directed such moments as throwing rattling o-ball to hit a tinkling roly-poly, or turning off the lights at the final falling asleep toy-piano solo. I indicated the exact position of the instruments not only for the sake of convenience of performance, but to emphasize the symbolism of big vs small or adult vs child. Thus, this piece contributes to the diversity in our field by reflecting on every day routine of a mother, as well as using visual and other means to fulfil the new performance means of video presentation.

After The End of Time commemorates monumental *Quartet to the End of Time* by Olivier Messiaen, which he composed and premiered while in a prisoner-of-war camp during WWII. Although comfortably isolating at home during the pandemic is certainly nothing similar to being imprisoned at war, the sense of uncertainly persists in both of these situations. Thus, my piece directly reflects current times through the emotional context of the music. The movements subtitled: i. Chaos, ii. Isolation, iii. Protest, iv. Unification, v. Aftersounds. These concepts often found literal reflection in musical material. For example, in the 2nd movement , Isolation, the players must ignore each other. Among other features: unusual tuning of the clarinet, and montage-like nonlinear structure with sudden repetitions.

The complete result of this project could be evaluated once the pieces are performed (whether through live performance, video recording, or livestreaming). Part of my FYAP funds covers the visits of the corresponding ensembles to FSU, which now may turn remote. Unheard-Of Ensemble plans to premiere *After The End of Time* on October 5th in New York (livestreamed), and on November 12 as a part of their FSU virtual residency (livestreamed and recorded). Icarus Quartet will perform *Sleep N Play* on March 25 at the Dohnányi Recital Hall at FSU. Moreover, I received inquiries from other groups – further performances could serve as opportunities for me to revise the pieces after their premieres, to polish and push even further my creative ideas.

Pictures from the top (used with the permission of owners): Icarus Quartet performing one of their standard repertoire pieces; Unheard-Of Ensemble press photo; score excerpt from the second movement of After The End of Time; the performance directions and first page of the score of Sleep n Play.

Cortical processing of chemosensory and hedonic features of taste in active licking mice

Cecilia Bouaichi and Roberto Vincis

Department of Biological Sciences and Program in Neuroscience, Florida State Univeristy, Tallahassee FL.

https://www.bio.fsu.edu/vincislab/ ✕ VincisLab

Introduction

In the last two decades, a considerable amount of work has been devoted to investigating the neural processing and dynamics of the primary taste cortex of rats. Surprisingly, much less information is available on cortical taste electrophysiology in awake mice, an animal model that is taking a more prominent role in taste research. Here we present electrophysiological evidence demonstrating how the gustatory cortex (GC) encodes information pertaining the basic taste qualities (sweet, salty, sour, and bitter) when stimuli are actively sampled through licking, the stereotyped behavior by which mice control the access of fluids in the mouth. Mice were trained to receive each stimulus on a fixed ratio schedule in which they had to lick a dry spout six times to receive a tastant on the seventh lick. Electrophysiological recordings confirmed that GC neurons encoded both chemosensory and hedonic aspects of actively sampled tastants. In addition, our data revealed two other main findings. GC neurons encoded information about taste identity in as little as 120 ms. Consistent with the ability of GC neurons to rapidly encode taste information, nearly half of the recorded neurons exhibited spiking activity that was entrained to licking at rates up to 8 Hz. Overall, our results highlight how the GC of mice processes tastants when they are actively sensed through licking, reaffirming and expanding our knowledge on cortical taste processing.
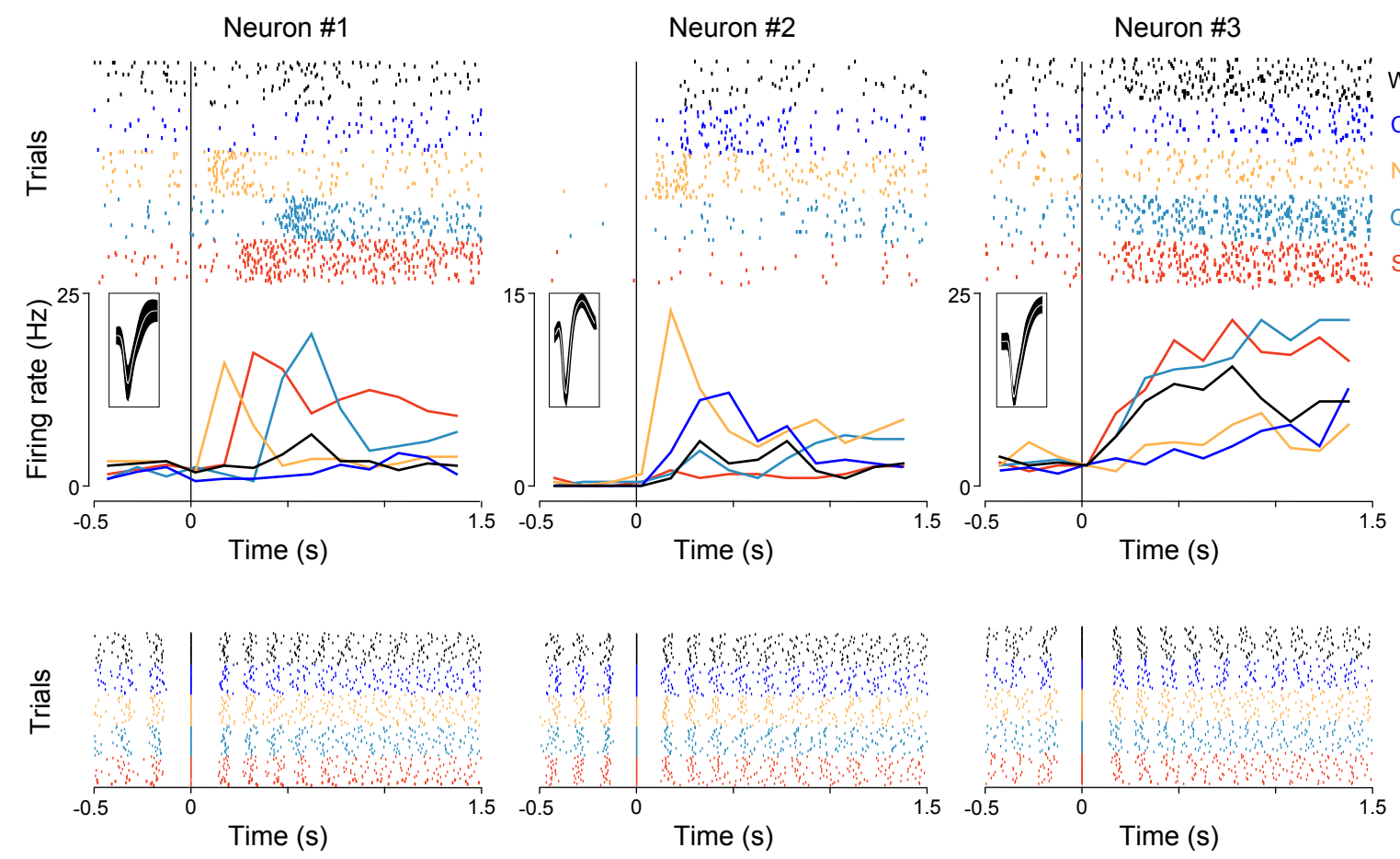
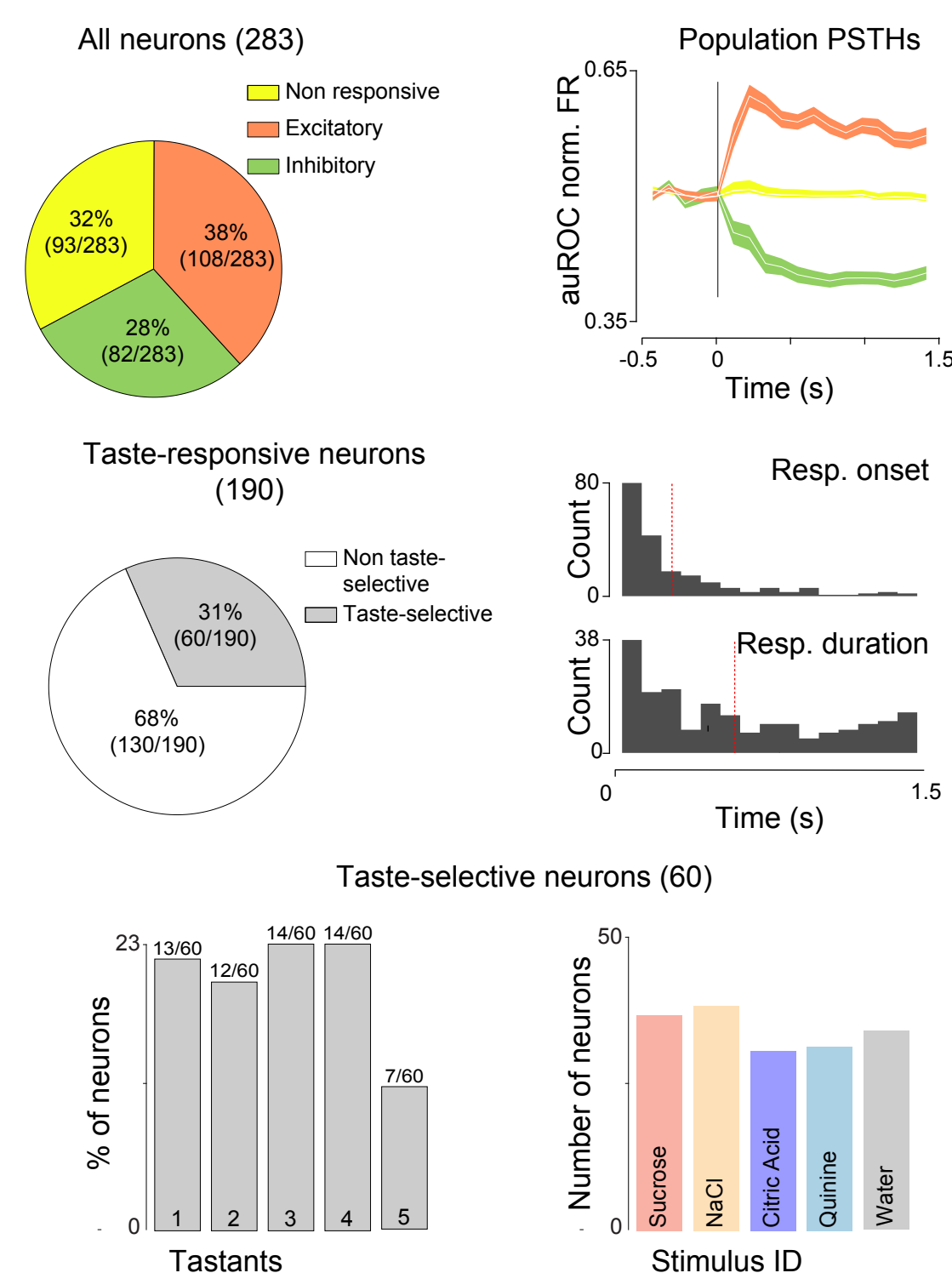## 1 - Tetrodes placement and single neuron recording
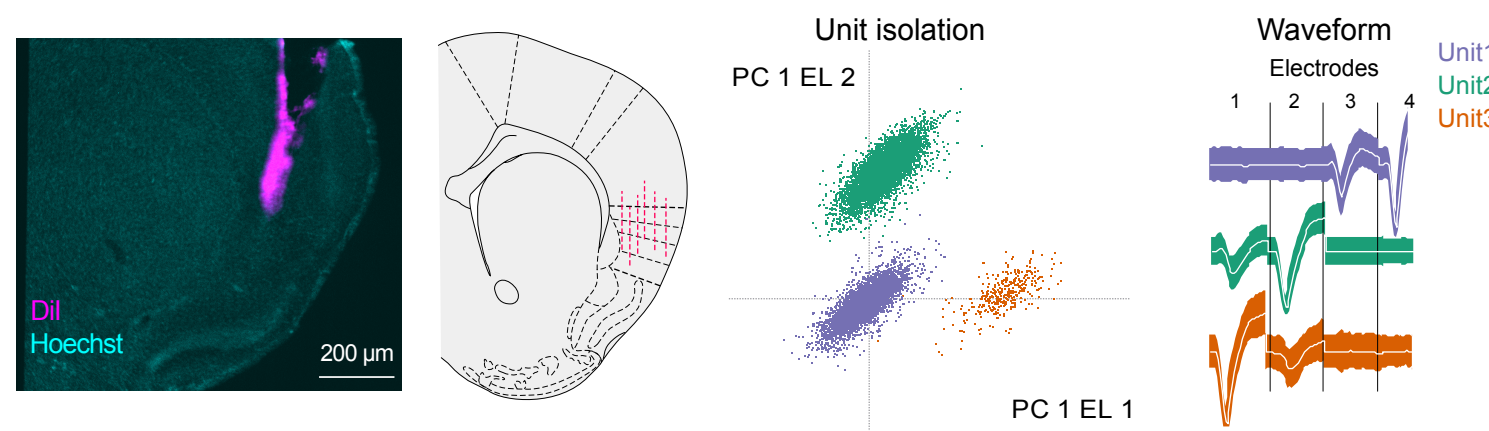
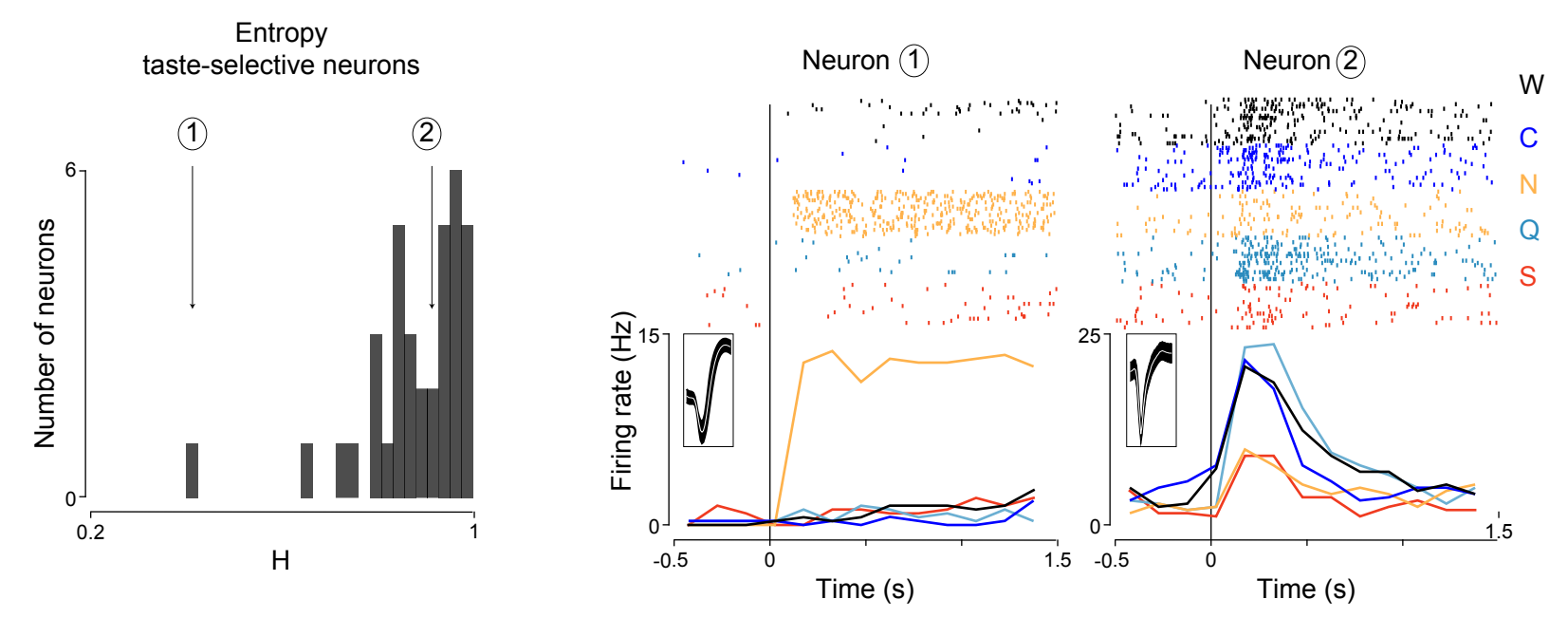## 2 - Experimental design and taste-evoked licking pattern
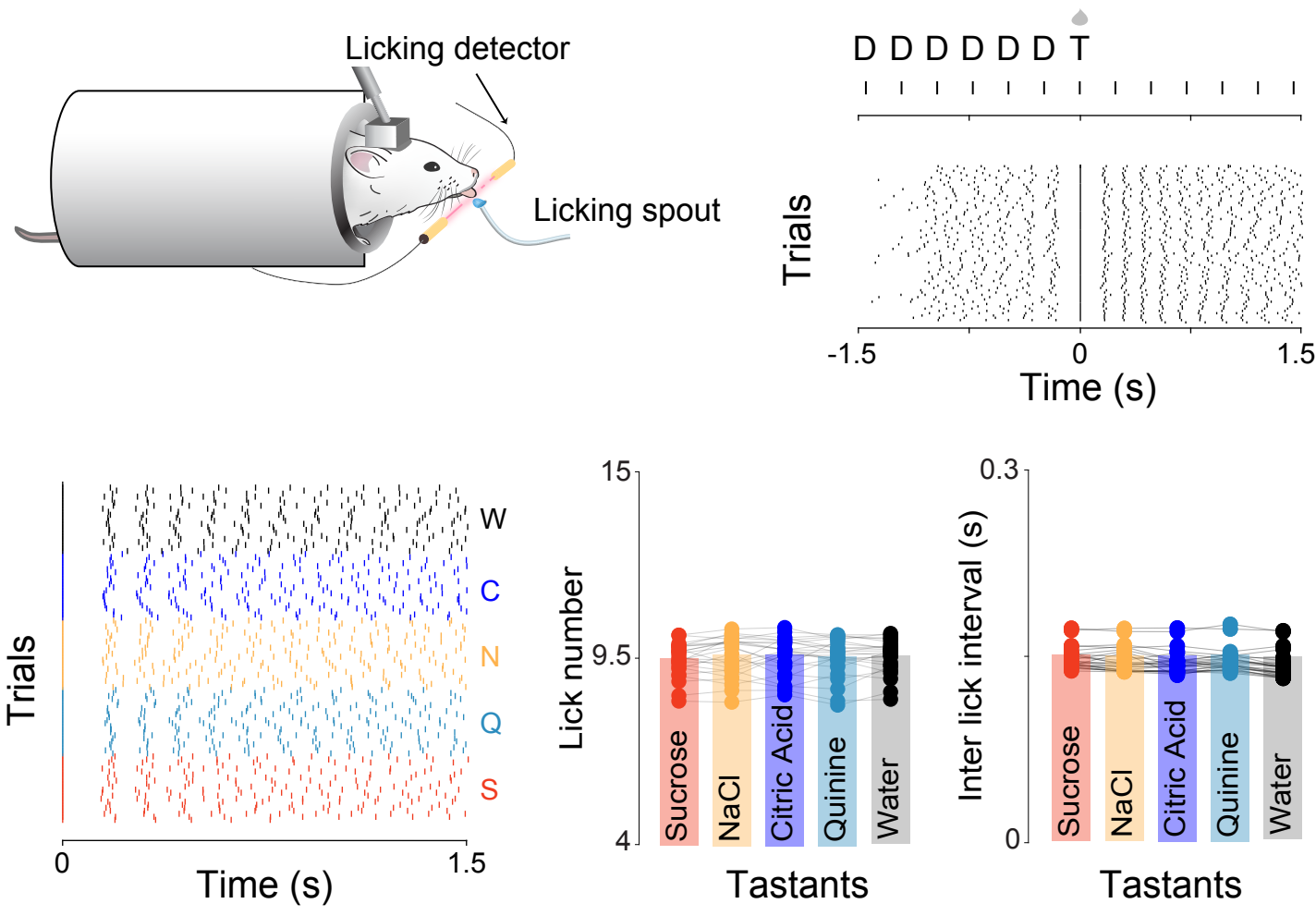
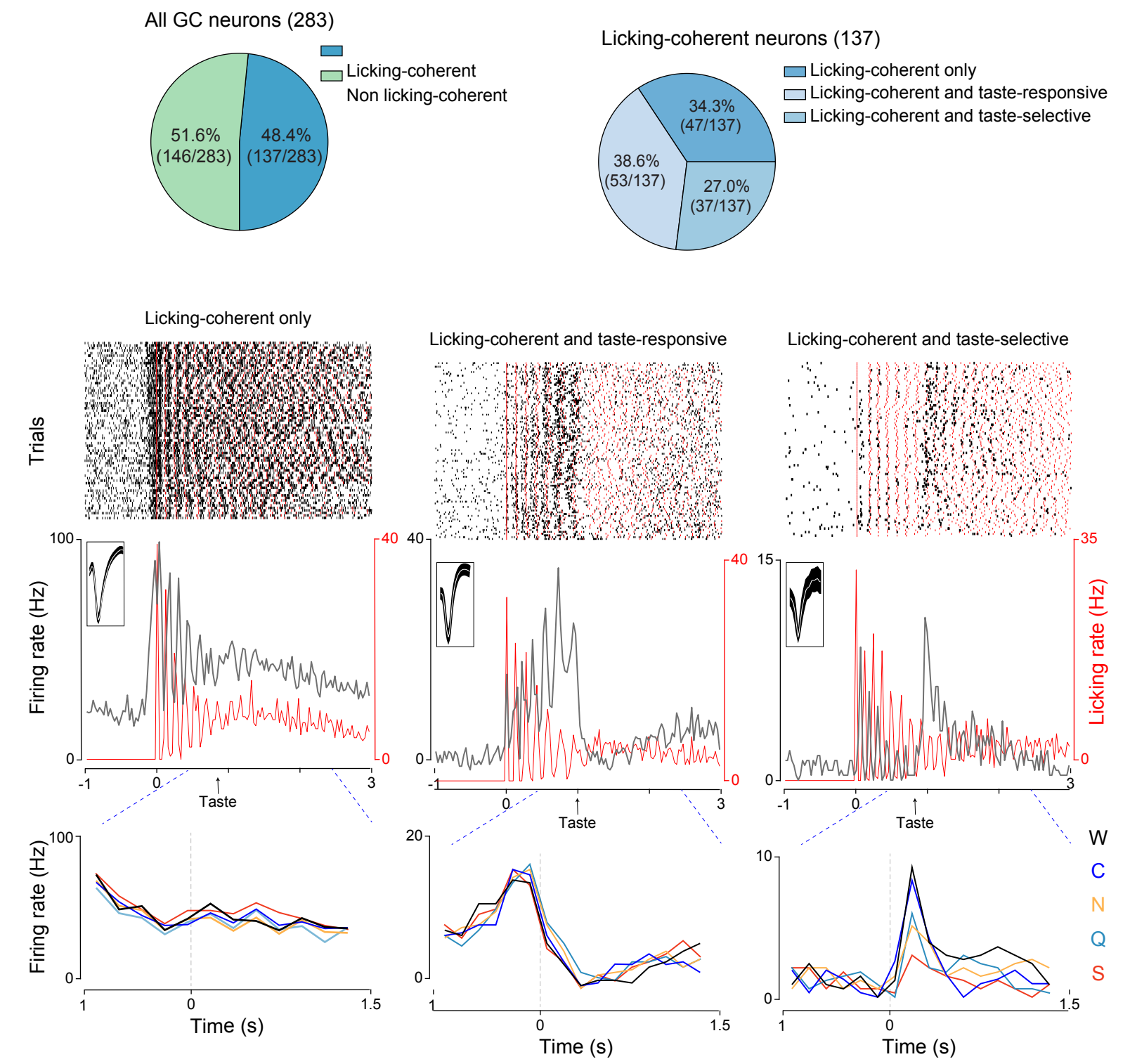## 3 - Taste responses in active licking mice

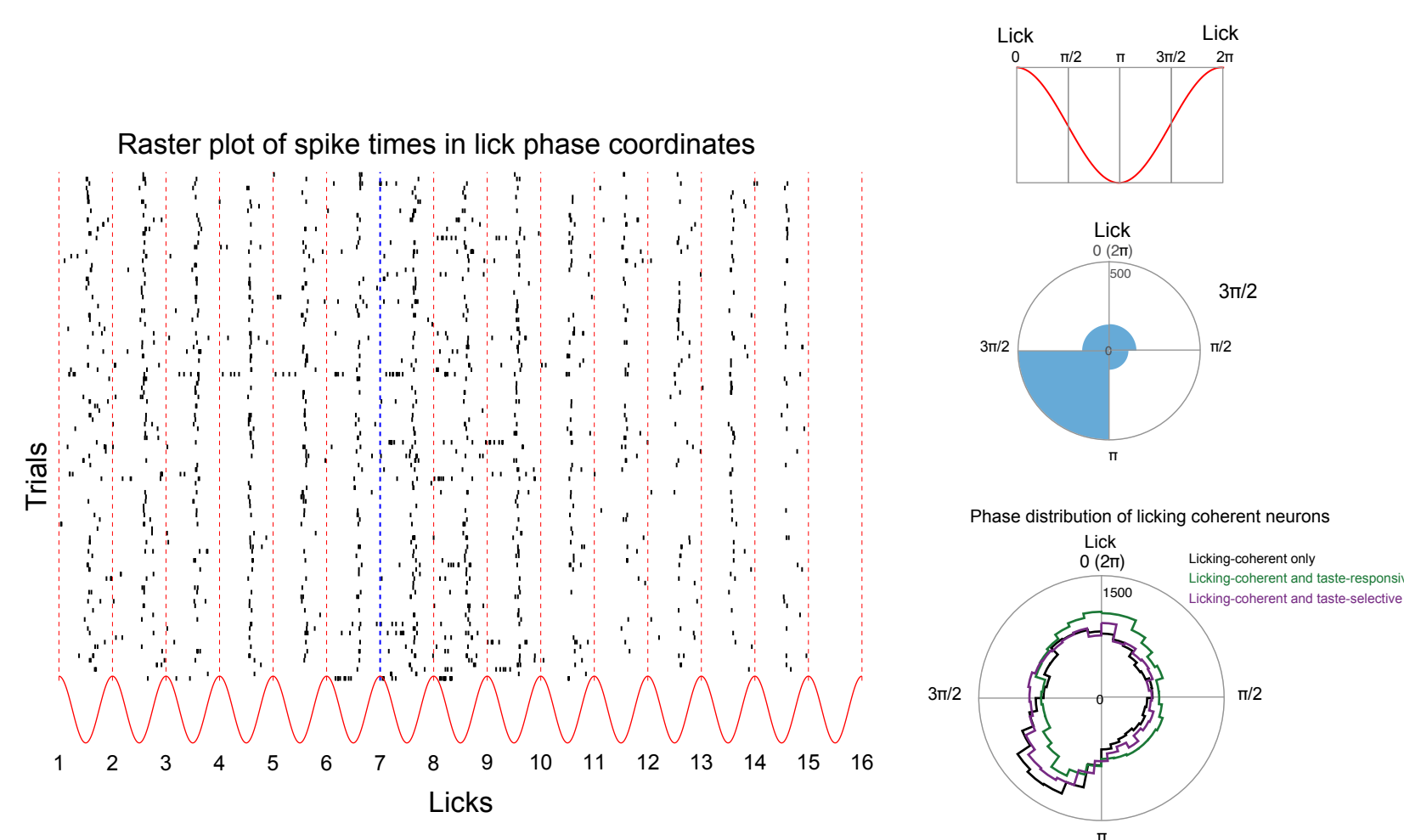## 4 - Quantification of taste responses in the mouse GC

5 - Tuning of taste-selective neurons
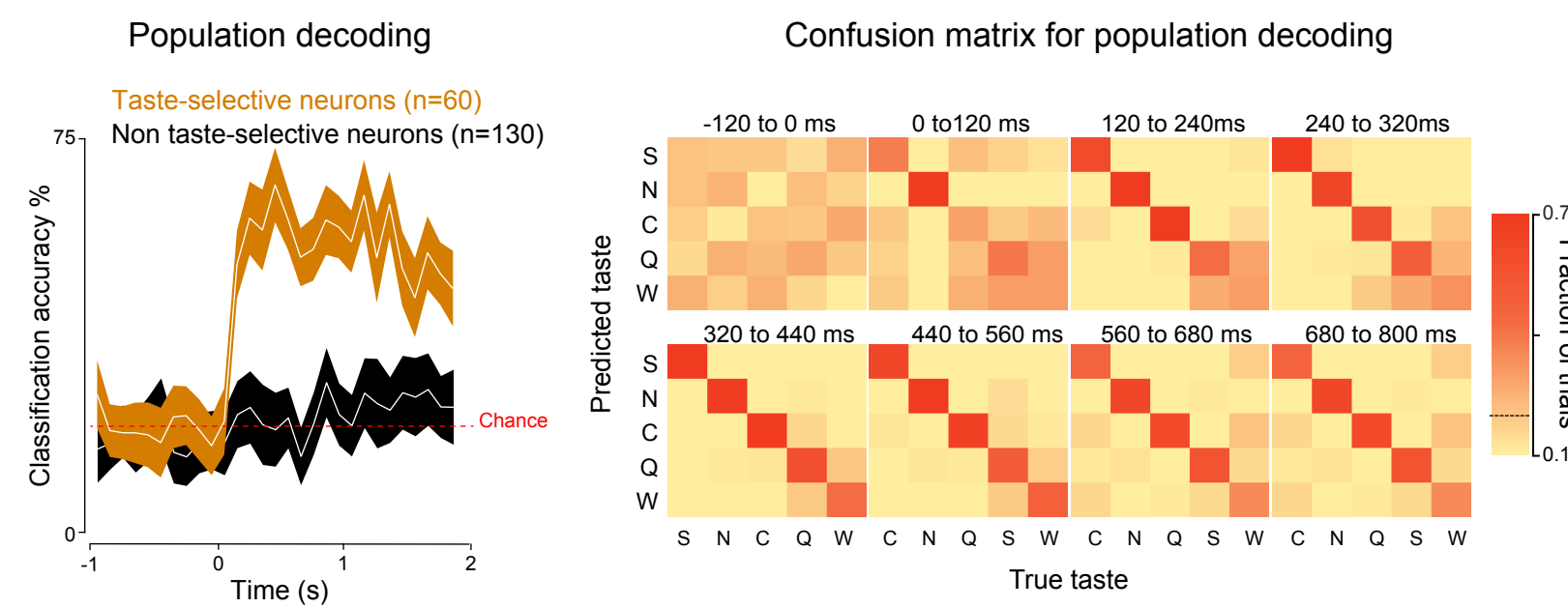

6 - Licking-related neural activity in the mouse GC

7 - Phase lick activity in the GC

8 - Licking activity in the mouse GC

Conclusions

The results presented here provide evidence on how the gustatory cortex (GC) of mice encodes taste information when stimuli are sampled via active licking.

Around 30% of the recorded neurons displayed chemosensory-specific spiking activity, with the majority encoding for more than one taste.

GC neurons also processed information of the hedonic value of tastants. Stimuli with similar palatability (i.e. sucrose and NaCl; citric acid and quinine) evoked similar firing activity in more than half of the taste-selective neurons.

Nearly half of the GC neurons were coherent with licking, likely processing general tactile and motor activity.

Notably, almost 30% of licking-coherent neurons were also taste-specific, highlighting the capability of the GC to multiplex different features of taste experience.

A novel high throughput screening system to identify negative regulators of human beta cell proliferation

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Research goal

Diabetes is caused by the loss of the insulin producing cells --- beta cells. One of the promising approaches to cure diabetes is to make more beta cells. The aim of our laboratory is to identify novel targets regulating human beta cell replication through innovative molecular/cellular approaches. Our ultimate goal is to develop beta cell regeneration therapies to treat diabetes.
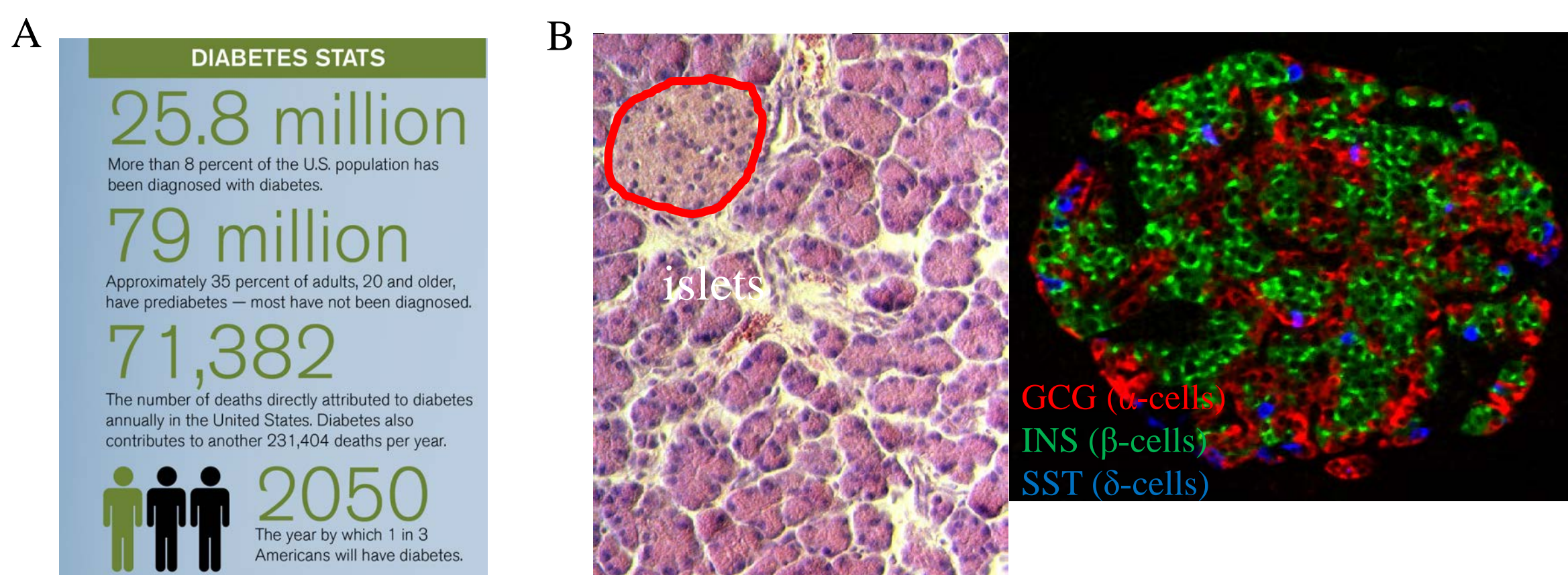

Fig. 1. Diabetes is caused by a lack of beta cells. (A) Diabetes is one of the most abundant and costly chronic disorders. Adapted from houstonmethodist.org/diabetes. (B) Histology of pancreas. Endocrine cells cluster in islets (red circle) that contribute to less than 5% of pancreas mass. Within each islet, beta cells are intermingled with other endocrine cells.

Research direction 1: Integration and re-analyses of single-cell RNA-seq datasets

A

| Source	Single-cell method	# of cells
J. Li., *et al.* EMBO Rep. 2016.	Smart-seq2	70
A. Segerstolpe., *et al.* Cell Metab. 2016.	Smart-seq2	2,209
M. Baron., *et al.* Cell Syst. 2016.	inDrop	8,629
MJ. Murro., *et al.* Cell Syst. 2016.	CEL-Seq2	3,072
N. Lawlor., *et al.* Genome Res. 2017.	Fluidigm C1 96	1,050
M. Enge., *et al.* Cell. 2017.	Smart-seq2	2,544
Y. Xin., *et al.* Cell Metab. 2016.	Fluidigm C1 96	1,492
Y. Xin., *et al.* Diabetes. 2016.	10x Genomics Chromium V2	20,811
D. Grün., *et al.* Cell Stem Cell. 2016.	CEL-Seq	1,728
YJ. Wang., *et al.* Diabetes. 2016.	**Fluidigm C1 96**	**1,283**
YJ. Wang *et al.*	**Fluidigm C1 HT**	**4,917**
YJ. Wang *et al.*	**10x Genomics Chromium V1**	**4,493**
YJ. Wang *et al.*	**10x Genomics Chromium V2**	**17,782**
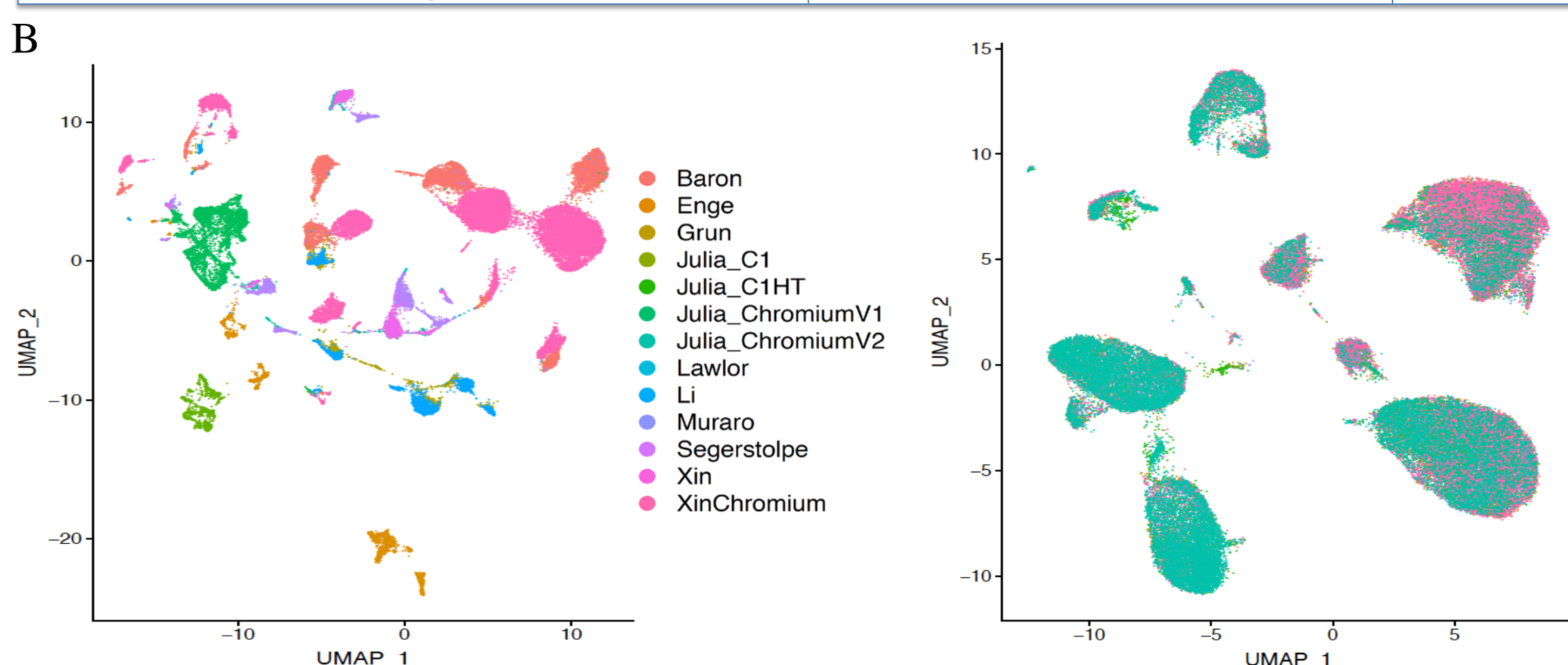
Fig. 2. Single-cell data integration. (A) Thirteen single-cell RNA-seq datasets on human pancreatic islet cells. (B) UMAP shows single-cell data pre- and post-integration. Cells are color-coded by their data sources.

Research direction 2: Unbiased transcriptomic profiling to identify modulators of beta cell proliferation
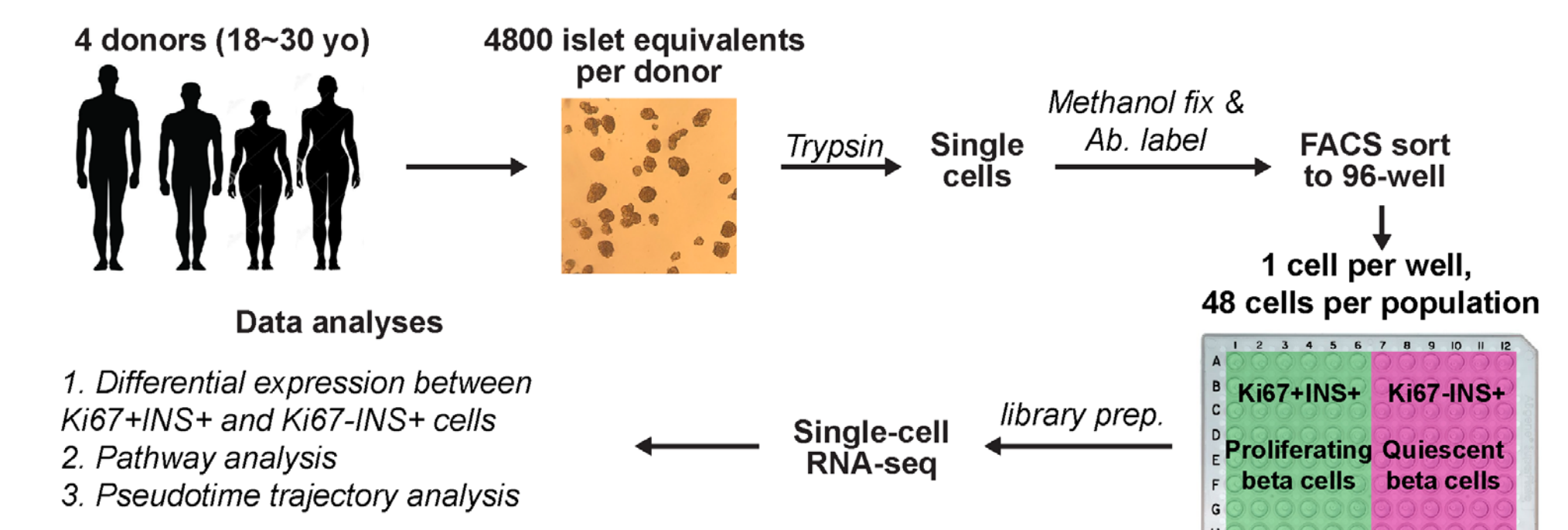

Fig. 3. Experimental scheme of using single-cell RNA-seq to characterize naturally proliferating beta cells.

Research direction 3 (FYAP project): Candidate approach to identify modulators of beta cell proliferation
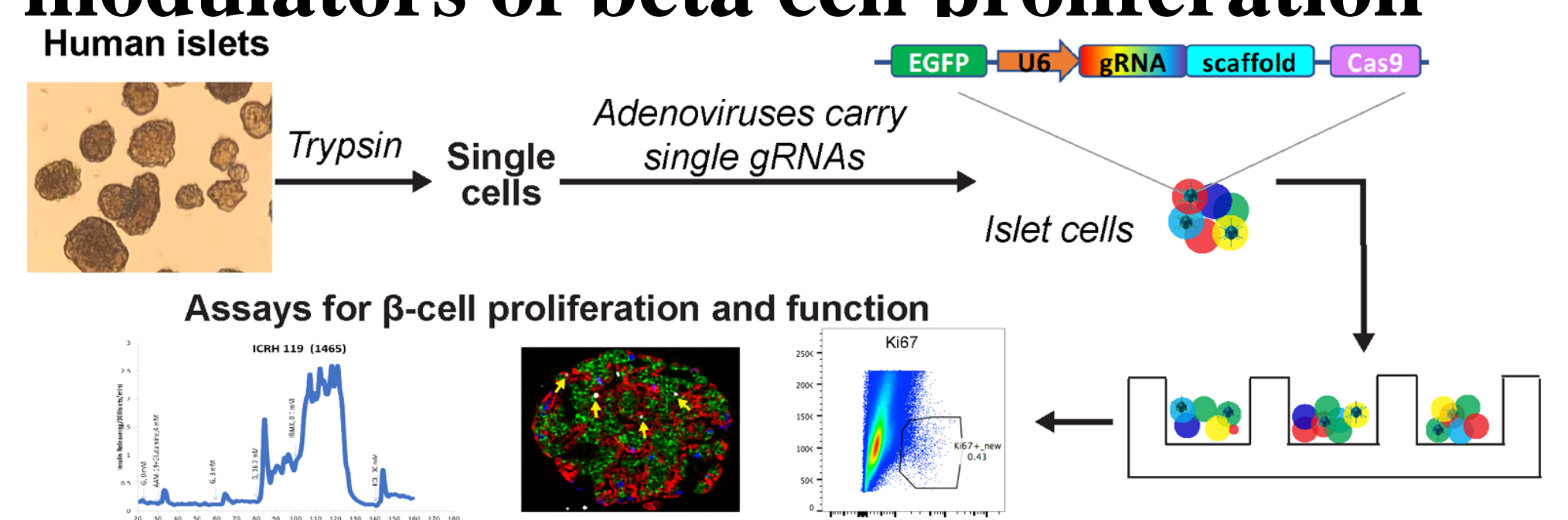

Fig. 4. Experimental scheme of using CRISPR loss-of-function approach to examine 27 candidate genes regulating beta cell proliferation.

Research direction 4: High throughput functional genomic approach to identify modulators of beta cell proliferation
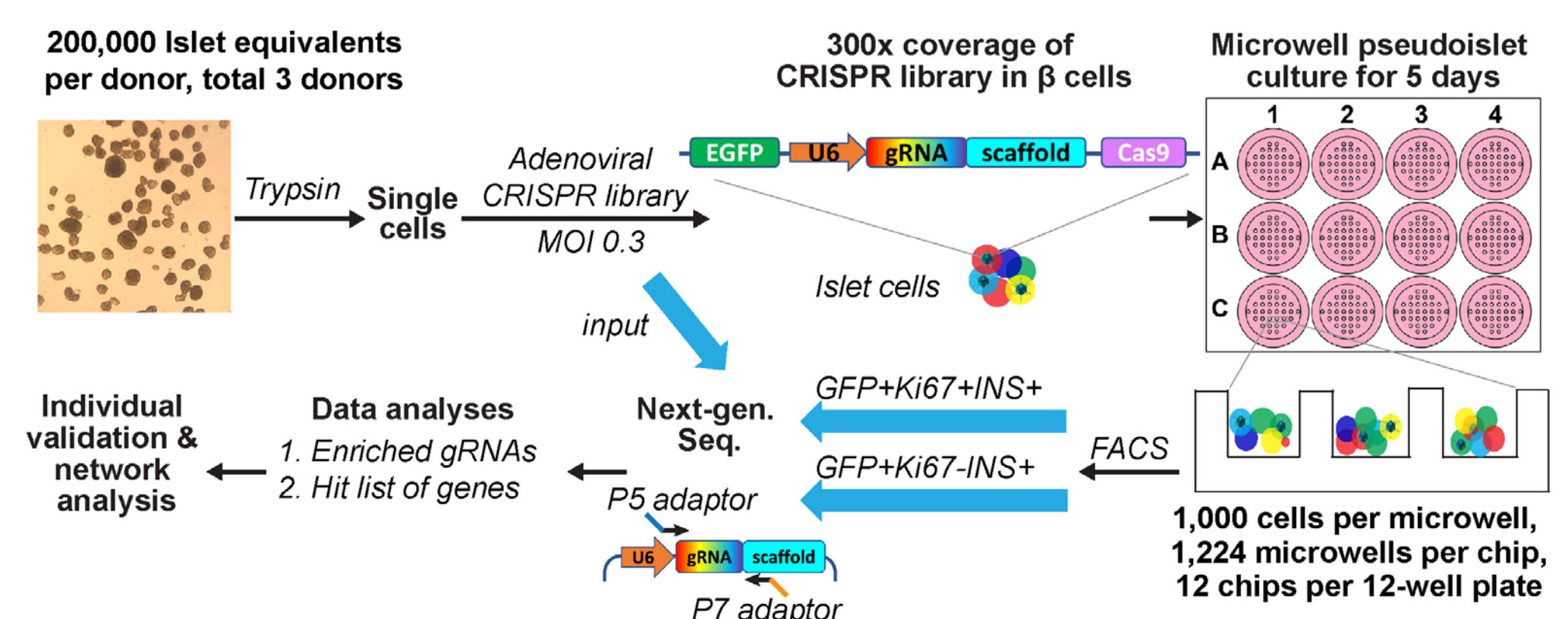

Fig. 5. Whole-genome CRISPR loss-of-function screening for inhibitors of beta cell proliferation.

Future directions

- To develop novel computational tools to analyze single-cell RNA-seq data
- To identify promising candidates that regulate beta cell proliferation and validate their functions in vivo

🏳️‍🌈 Clients' Coming Out Experiences in Counseling Sessions: Is This a Safe Space?

- Coming-out is a critical incident in a LGBTQ+ person's life, and one that warrants counselor's support.
- Counseling-related studies focusing on clients' coming out experiences during a counseling session is very limited.
- The purpose of this study is to explore LGBTQ+ clients' perceptions of their counseling experiences, especially their experiences coming out to their counselors.
- Participants: 1,072 individuals who identify themselves as LGBTQ+ in S. Korea. Responses of 791 (73.8%) individual who experienced counseling services were analyzed.

RQ1. Are LGBTQ+ clients coming out to their counselors?

⇒ 48.9% (n=387) reported that they came out.

* Was it voluntarily?
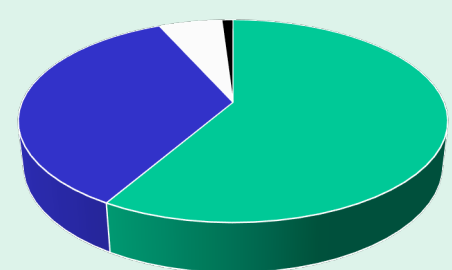
- Strongly agree
- Agree
- Disagree
- Strongly disagree

RQ2. What are the reasons why LGBTQ+ clients decide to/not to come out to their counselors?

Reasons to come out	Reasons not to come out
■ Presenting issue (39.5%) ■ Spontanesouly (66.4%) □ Outed by other (5.2%) ■ Counsleor just noticed (8.8%)	■ Not relevant to the presenting issue (47.6%) ■ Expected counselors' prejudice (31.5%) □ Fear of conversion therapy (10.2%) ■ Fear of outing (4.7%) ■ Etc. (6%)
1) Wanted to let counselor has better understanding of me (client) 2) Had to tell somebody 3) Didn't find any reason to hide 4) Counselor was a member of LGBTQ+ community 5) Psychological measurement had a question related to sexual orientation and gender identity	1) Counselor had presented lack of knowledge or homophobia 2) Counselor used non-inclusive language 3) Had not have clear my (client's) sexual identity, yet 4) Just did not want to come out with no reason. 5) Expected nothing changes whether come out or not

RQ3. How counselors reacted after coming-out?
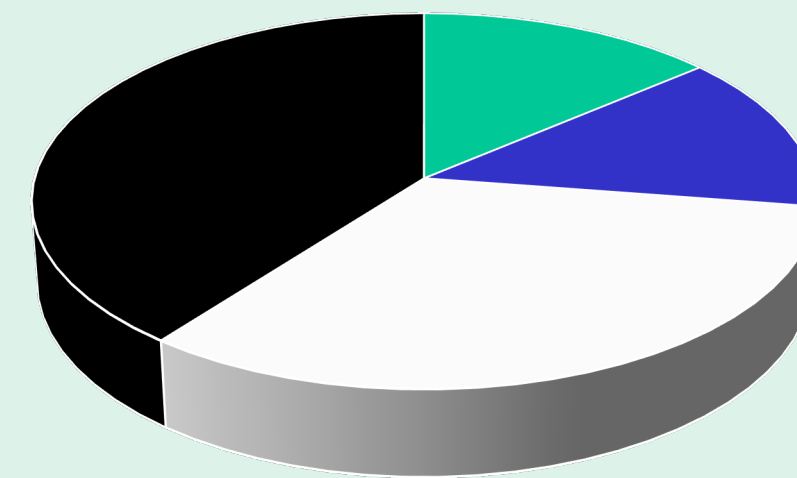
- Regarded this as a "problem" or a cause of all the problems. (17.6%)
- Denied or doubted client's sexual identity (17.3%)
- Treated it as nothing or a trival matter (42.1%)
- Accepted this as one of charcterstics of the client (particionat) (50.4%)

Other reactions can be considered as professional/ethical/competent
1) Respected and supported client's sexual identity
2) Explored how client's sexual identity impact client and client's issue(s)

Other reactions can be considered as unprofessional/unethical/incompetent
1) Suggested conversion therapy
2) Regarded it as a "phase"
3) Outed to parents/teacher
4) Seemed uncomfortable
5) Presented lack of knowledge
6) Suggested not to come out to others
7) Mentioned that they cannot accept it due to their religion

Etc.
1) Told their clients that they know somebody who identify as LGBTQ+ and/or ally
2) Counselor already knew my (client's) sexual identiy

RQ4. How LGBTQ+ clients perceive counselors' acceptance & empathy and its impact to counseling relationship?

a. More than half participants (58%) reported counselors accepted their sexual identity.

b. 40% reported their counselors presented empathy & understanding, whereas 38% reported that their counselors' empathy & understanding were not enough.

c. 35% reported coming-out positively impacted on counseling relationship, whereas 24% reported coming-out negatively impacted on counseling relationship.

Further studies developing better LGBTQ+ counseling competencies and exploring how counselors' reaction impact quality of counseling relationship/outcome are needed.

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Innovative 3D Printed Concrete Structures Enabled Via Integrated Structural and Material Design

Qian Zhang, Department of Civil and Environmental Engineering

Background and Motivation

3D concrete printing offers many advantages such as geometry freedom, formwork free construction, automated material handling, less material waste, expedited construction process, and enhanced construction safety. There exist several intrinsic challenges that prevent 3D concrete printing technology from completely replacing the traditional construction methods One involves the difficulties to place steel reinforcement. The other is associated with the so-called "cold joints" between the printed layers due to shrinkage of concrete, and therefore structural deficiencies at the interface. Both of these lead to insufficient structural capacities of 3D printed structures for heavily loaded structural applications.

Proposed Approach

- Innovation in Materials: ultra-high performance fiber reinforced concrete (UHPFRC) with high compressive (>100 MPa), tensile strength (>20MPa) and high ductility (8-10% strain capacity) is able to produce unreinforced structures with similar structural load carrying capacity to reinforced concrete structures
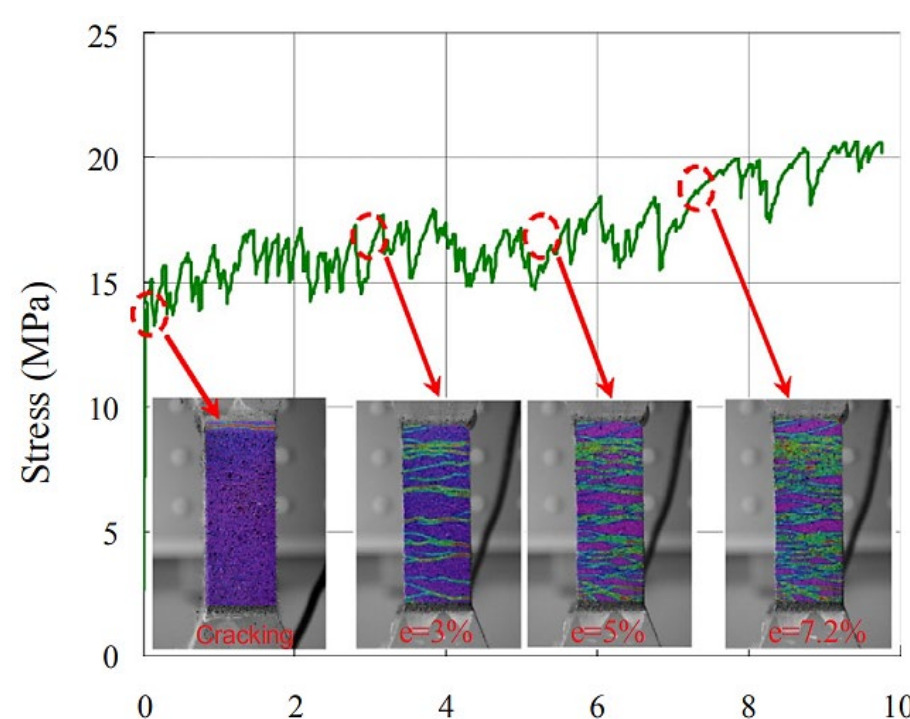
Tensile stress-strain relationship and multiple cracking of UHPFRC (Kequan Yu et al., 2018

- Innovative geometry: stress-line printing concept, i.e printing along the direction of principle stresses, minimizes the shear stress on the layer interface and reduces the negative influence of cold joints and weak interfaces

- It is proposed that by using integrated structural and material design (ISMD) methodology and combining *stress-line printing concept* and *ultra-high performance fiber reinforced concrete (UHPFRC)*, the printed structure will achieve high structural performance.

Experimental Program

UHPFRC Mixture Composition (kg/m^3)*

| Cement	Silica Fume	GGBFS	Silica Sand	Water	Fiber**	Superplasticizer
500	150	650	700	230	19	25

*Mix design adopted from Yu, Kequan, et al., 2017

**A ultra-high molecular weight polyethylene (PE) fiber was used

Geometric Design

- Stress lines for a 2D simply-supported shell member was generated using Rhino 6 with Karamba 3D plugin
- 3D beam models were generated by combining alternating tension stress line layers and compression stress line layers
- 3D models with different number of stress lines, different proportion of tension and compression layers were constructed
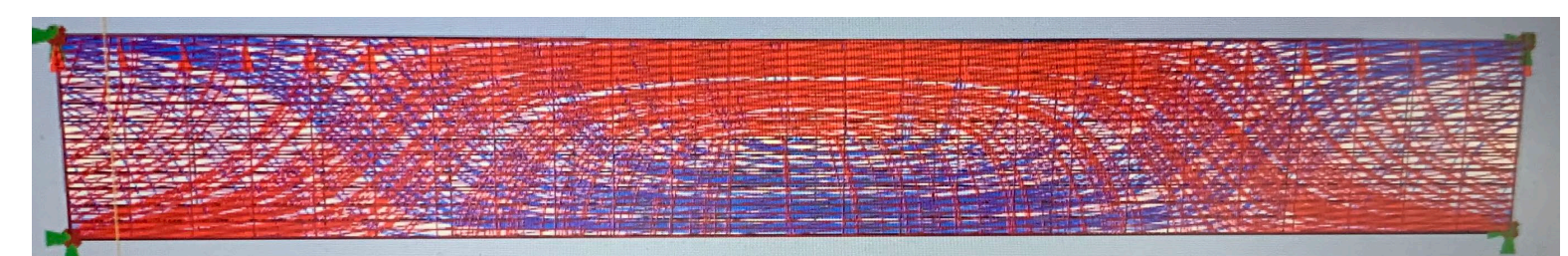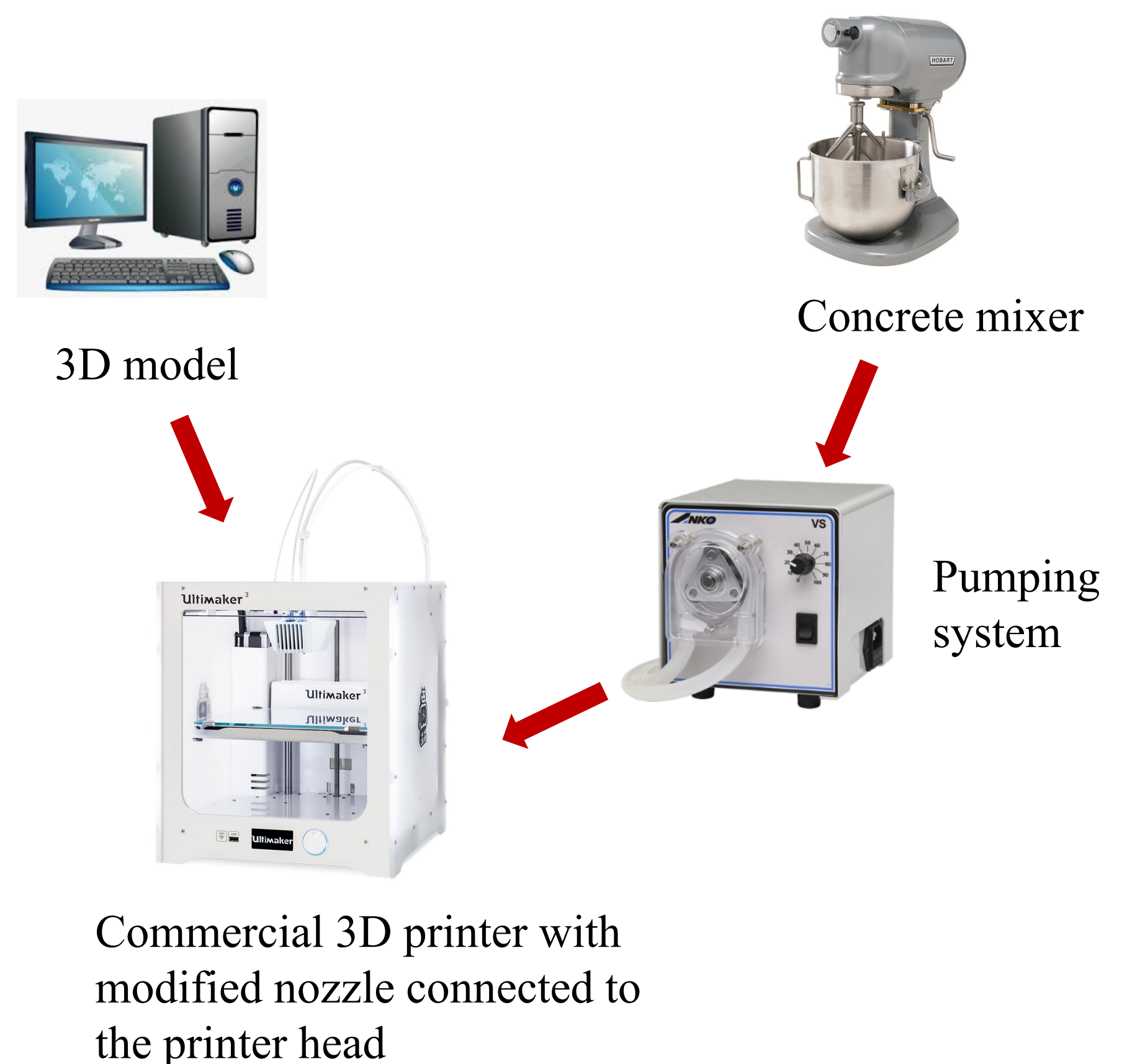

Calculated stress lines
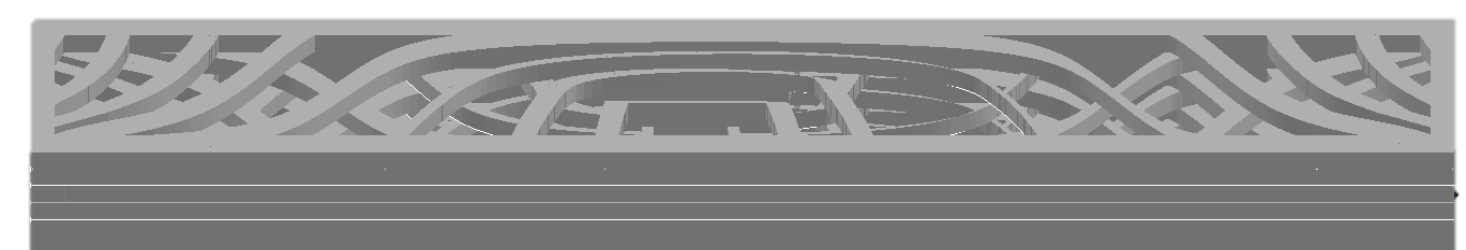
Example of 3D model based on stress lines

Printing System

3D model

Concrete mixer

Pumping system

Commercial 3D printer with modified nozzle connected to the printer head

Progress and Future Work

- UHPFRC mixture has been prepared and verified
- 3D printer system has been constructed and tested
- 3D models have been constructed based on the stress-line concepts
- Fabrication and testing of the 3D printed concrete specimens is underway

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To Straddle or Not to Straddle?: Audit Partner Experience and Audit Quality

with Colleen Boland, UW-Milwaukee and Stefanie Tate, UMass-Lowell

➢ **RQ: This study seeks to examine whether audit quality is influenced by whether an audit partner is a specialist in one audit domain ("non-straddler") or a generalist that has experience in multiple domains (in other words, "straddles" multiple audit types; hereafter, "straddler").**

➢ **Results**

    ➢ Analyzing Single Audits of nonprofit organizations from 2016-2019, we find that, compared to audit partners that do not audit any public companies, audit partners with public company audit experience are less likely to issue adverse internal control opinions over financial reporting and compliance with major federal programs and are more likely to issue going concern modified audit opinions.

    ➢ In addition, when compared to partners that do not conduct any Single Audits, audit partners that conduct both public company audits and Single Audits are more likely to issue adverse internal control opinions and more likely to issue going concern modified opinions if they conduct more than one Single Audit.

➢ **Implications**

    ➢ Our evidence suggests a spillover effect in both directions: public company audit experience into the Single Audit arena and Single Audit experience into the public company audit arena.

    ➢ **The broader implications of this study speak to the importance of audit partner experience in the delivery of audit quality. The study informs audit firms and stakeholders about the considerations they should give to audit partner experience and client portfolio. Nonprofit audit committees should carefully evaluate the lead partner's portfolio of experience. Further, audit firms and audit regulators should be interested in how knowledge and experience transfer across different, albeit highly regulated sectors, as it could inform how to appropriately manage audit risk and/or provide appropriate sector-level training.**

	Big4	Next4	Remainder (small firms)	Total Distinct Partners
Public Company Final Sample for SOX 404(b) Audits Only				
Straddlers	57	31	26	114
Non-Straddlers	1,844	337	269	2,450
Total				2,564
Nonprofit Organizations Final Sample for All Audits				
Straddlers	70	34	75	179
Non-Straddlers	279	262	854	1,395
Total				1,574

Logistic regression for DV=Prob(MW=1) – Entropy balanced

	Public Company Sample		Nonprofit Sample	
Variables	(1)	(2)	(3)	(4)
Test Variables (1-tailed)				
PARTNER_STRADDLER	-0.193		-0.517**	
	(-0.67)		(-2.32)	
STR_NO_IND_OVERLAP		-0.223		-0.531**
		(-0.70)		(-2.26)
STR_IND_OVERLAP		-0.322		-0.381
		(-0.56)		(-0.55)

Going concern modified audit opinion issuance logistic regression analysis (Prob(GC)=1) – Entropy balanced

	Public Company Sample		Nonprofit Sample	
Variables	(1)	(2)	(3)	(4)
PARTNER_STRADDLER	-0.251		0.288	
	(-1.24)		(0.66)	
STR_NO_IND_OVERLAP		-0.371**		0.420
		(-1.68)		(0.98)
STR_IND_OVERLAP		0.379		0.000
		(0.76)		(.)

Status: Revising for initial journal submission.

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