SEP 2026

Edward Bradford Titchener
1867 - 1927

"To advance psychology by arranging informal conferences on experimental psychology."

Welcome to the annual meeting of the Society of Experimental Psychologists (SEP). Founded in 1929, the Society is dedicated to advancing psychology through the open exchange of ideas and the discussion of experimental research. For nearly a century, SEP meetings have remained intentionally small and informal, fostering lively conversation and collaboration among researchers.

Each year, members gather to share new findings across areas including cognitive, developmental, social, behavioral, and neuroscience research. The Society also honors exceptional contributions to the field through awards such as the Howard Crosby Warren Medal and the Norman Anderson Lifetime Achievement Award.
We are delighted to welcome you and look forward to an engaging and stimulating meeting.

Date & Time:

APRIL 17-19 2026

Location

Princeton University

609-258-7731 sep.psychology.princeton.edu sepsych.org

EVENT SCHEDULE

DATE & TIME	ACTIVITY	LOCATION
FRIDAY APRIL 17, 2026 6:30PM	WELCOME RECEPTION DRINKS AND LIGHT FARE	SALLY FRANK CAFE & LOWER GARDEN PROSPECT HOUSE PRINCETON UNIVERSITY
SATURDAY APRIL 18, 2026 8:00AM-6:00PM	MEETING AND TALKS BREAKFAST AND LUNCH SERVED	CARL ICAHN 101
SATURDAY APRIL 18, 2026 7:00PM	BANQUET DINNER	PEACOCK INN 20 BAYARD LANE PRINCETON, NJ
SUNDAY APRIL 19, 2026 8:00AM-5:00PM	MEETING AND TALKS BREAKFAST AND LUNCH SERVED	CARL ICAHN 101

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TRANSPORTATION

DATE & TIME	PICK UP	DROP OFF
FRIDAY APRIL 17, 2026 6:15PM	NASSAU INN & GRADUATE HOTEL ONLY	WELCOME RECEPTION
FRIDAY APRIL 17, 2026 9:00PM	WELCOME RECEPTION	NASSAU INN & GRADUATE HOTEL ONLY
SATURDAY APRIL 18, 2026 7:30-7:45AM	NASSAU INN & GRADUATE HOTEL ONLY	CARL ICAHN 101
SATURDAY APRIL 18, 2026 6:00PM	CARL ICAHN 101	NASSAU INN & GRADUATE HOTEL ONLY
SUNDAY APRIL 19, 2026 7:30-7:45AM	NASSAU INN & GRADUATE HOTEL ONLY	CARL ICAHN 101
SUNDAY APRIL 19, 2026 5:00PM	CARL ICAHN 101	NASSAU INN & GRADUATE HOTEL ONLY

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WELCOME RECEPTION

6:30PM DRINKS AND LIGHT FARE AT SALLY FRANK CAFE & LOWER GARDEN
PROSPECT HOUSE, PRINCETON UNIVERSITY

BAR
VARIETY OF CRAFT & IMPORTED BEER
HOUSE WHITE WINE - BENVOLIO
HOUSE RED WINE - BARROSA
SODAS AND JUICES

PASSED HORS D'OEUVRES
CHILI HONEY COMPRESSED CANTALOUP, TAHINI DIP
COCONUT CHICKEN TENDER, CREAMY SWETT CHILI SAUCE
SMOKED SALMON, SWEET PEA CREAM CHEESE, PICKLED RED ONION, TOAST
SPICY TUNA TACO, SHAVED RADISH, MICRO CILANTRO, AVOCADO
LOBSTER MAC AND CHEESE BITES
BBQ PULLED PORK ON CORNBREAD

BOARDS
ARTISANAL CHEESE
CHARCUTERIE
MEDITIRRANEAN

HAPPY HOUR RECEPTION
ARTICHOKE GOAT CHEESE BITES (VG)
THAI CURRY PHYLLO TRIANGLE (V)
MINI WAGYU CHEESEBURGER SLIDERS
SOUTHWEST BLACK BEAN & CHEDDAR SPRING ROLLS, CHILE CREMA (VG)
NASHVILLE HOT CHICKEN SKEWERS, SPICY RANCY
CHORIZO EMPANADA, LIME SOUR CREAM
INDIAN SAMOSA, TOMATO CHUTNEY (V)
CHILLED SPINACH ARTICHOKE DIP, KETTLE POTATO CHIPS (VG)

DESSERTS
ASSORTED MACARONS
MINI FRESH FRUIT TARTS
PETITE CHOCOLATE ECLAIRS
CITRUS MADELEINES
VANILLA BEAN PROFITEROLES
CHOCOLATE GANACHE TART

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PROGRAM 4/18

TIME	SPEAKER	TITLE
8:00-9:00 AM	**BREAKFAST**	**HOT BUFFET**
9:00-9:10 AM	SABINE KASTNER	WELCOME
9:10-9:40 AM	**(NEWCOMBE)** MORTON ANN GERNSBACHER	**LIFETIME AWARD PRESENTATION** Cognitive processes and mechanisms in comprehension
SESSION 1 (CHAIR: TANIA LOMBROZO)		
9:40-9:55 AM	ELKE WEBER	Query Theory: A process account of constructed judgments or preferences
9:55-10:10 AM	RALPH MILLER	Effects of event frequency as a function of directly and indirectly experienced events
10:10-10:25 AM	SUDEEP BHATIA	Search through memory structure
10:25-10:40 AM	HERBERT TERRACE	What is a word?
10:40-11:10 AM	**BREAK**	**COFFEE AND LIGHT SNACK**
SESSION 2 (CHAIR: KEN NORMAN)		
11:10-11:25 AM	TANIA LOMBROZO	The psychology of inconsistent beliefs: Recognizing, reconciling, and revising

...PROGRAM 4/18

TIME	SPEAKER	TITLE
11:25-11:40 AM	HONGJING LU	Perception of social actions: A latent force model
11:40-11:55 AM	JOHN HUMMEL	A computational phylogenesis of intelligence, biological and artificial
11:55 AM-12:10 PM	MOSHE BAR	Progression as a path to longevity
12:10-1:30 PM	**LUNCH**	**SANDWICHES AND SALADS**
1:30- 2:00 PM	**(NEWCOMBE) KASTNER**	**WARREN MEDAL PRESENTATION**
SESSION 3 (CHAIR: ELKE WEBER)		
2:00-2:15 PM	MARISA CARRASCO	TMS reveals a cortical double dissociation between endogenous and exogenous covert spatial attention
2:15-2:30 PM	RUSSELL EPSTEIN	Spatial codes in the human brain during naturalistic navigation
2:30-2:45 PM	JEREMY WOLFE	I don't know when to quit: The problem of search termination
2:45-3:00 PM	ROBERT GOLDSTONE	How does the distribution of shapes affect their perceived relative similarity?

...PROGRAM 4/18

TIME	SPEAKER	TITLE
3:00-3:30 PM	**BREAK**	**COFFEE REFRESH**
SESSION 4 (CHAIR: LYNN NADEL)		
3:30-3:45 PM	KEITH HOLYOAK	Metaphor is more than analogy
3:45-4:00 PM	BARBARA LANDAU	Geometry and force dynamics in simple spatial terms: Two theories, one resolution
4:00-4:15 PM	ROBERT KNIGHT	Orbital frontal cortex and human behavior
4:15-4:30 PM	DIANE BECK	Neurally-guided deep neural nets support a hierarchical disentangling of category manifold across the human visual cortex
4:30-4:45 PM	BARBARA KNOWLTON	Assessing behavioral control across the adult lifespan using a novel outcome revaluation task
4:45-5:00 PM	STEVEN SLOMAN	The cost of conviction
5:00-6:00 BUSINESS & PHOTO		

BANQUET DINNER

7:00PM DINNER AT THE PEACOCK INN
20 BAYARD STREET PRINCETON, NJ

FOUR COURSES

ARTISAN BREAD
SALTED EUROPEAN BUTTER
gluten-free option

FIRST COURSE
MIXED GREESN SALAD

APPETIZERS
CRUDITE
sweet potato hummus, red chicory, heirloom baby carrots, broccolini, butternut swuash ribbons, extra virgin olive oil,
BUTTERNUT SQUASH SOUP
spiced apples
JUMBO SHRIMP COCKTAIL
classic cocktail sauce, lemon

ENTREES
choice of one from the following
MOROCCAN VEGETABLE POT PIE
potatoes, carrots, fennel, tomatoes, apricots, pecans
gluten-free option upon request
ORA KING SALMON
roasted sunchokes, broccolini, carrot-harissa puree, yogurt-dill sauce
ROASTED GRIGGSTOWN FARM CHICKEN
trumpet royal mushrooms, asparagus and potato pave with a prosecco sauce
NY STRIP STEAK
steamed broccolini and french fries

DESSERTS
choice of one from the following
LA MARIEE 'THE BRIDE'
bourbon vanilla cake, vanilla bavarian mousse with vanilla streusel, vanilla bean whipped cream
HOUSE MADE
vanilla gelato : chocolate gelato : strawberry sorbet

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PROGRAM 4/19

TIME	SPEAKER	TITLE
8:00-9:00 AM	**BREAKFAST**	**CONTINENTAL**
SESSION 5 (CHAIR: DIANE BECK)		
9:00-9:15 AM	PETER BALSAM	Construal in associative learning
9:15-9:30 AM	CHARLES BRAINERD	From association to gist
9:30-9:45 AM	TOM GRIFFITHS	Bayes in the age of intelligent machines
9:45-10:00 AM	NORA NEWCOMBE	Spatial perspective taking is distinct from cognitive and affective perspective taking
10:00-10:15 AM	RICHARD SHIFFRIN	A model for recognition accuracy and RT based on feature collection
10:15-10:30 AM	LAURENCE MALONEY	Allocating resources across time
10:30-11:00 AM	**BREAK**	**COFFEE AND LIGHT SNACK**

...PROGRAM 4/19

TIME	SPEAKER	TITLE
SESSION 6 (CHAIR: TOM GRIFFITHS)		
11:00-11:15 AM	JAMES TOWNSEND	The neural efficiency score: Quantifying the relationship between work accomplished and energy expended using response times and EEG
11:15-11:30 AM	TIM PLESKAC	Where are the context effects?
11:30-11:45 AM	BARBARA MELLERS	AI-assisted adversarial collaboration
11:45 AM-12:00 PM	PETER KILLEEN	Lotteries
12:00-1:30 PM	**LUNCH**	**HOT LUNCH**
SESSION 7 (CHAIR: JON COHEN)		
1:30-1:45 PM	FRANK TONG	Leveraging deep neural networks to model human perceptual learning of robust object recognition
1:45-2:00 PM	MARY A PETERSON	Ambiguity and reentrant processing in object detection
2:00-2:15 PM	RUSSELL POLDRACK	Experimenters and correlators become one: Revisiting Chronbach's two disciplines

...PROGRAM 4/19

TIME	SPEAKER	TITLE
2:15-2:30 PM	RANDY GALLISTEL	Context as temporal containment
2:30-2:45 PM	VALERIE REYNA	A fuzzy trace theory of vaccination behaviors and intentions: The case of influenza
2:45-3:00 PM	PHIL KELLMAN	From neural units to constant curvature representations of contour shape
3:00-3:30 PM	**BREAK**	**COFFEE AND GRAB AND GO SNACK**
SESSION 8 (CHAIR: SABINE KASTNER)		
3:30-3:45 PM	HENRY ROEDIGER	When does re-studying matter?
3:45-4:00 PM	JEROME R BUSEMEYER	Using quantum probability to understand contextual reasoning
4:00-4:15 PM	MICHAEL KAHANA	A theory of memory for items and associations (CMR-IA)
4:30-4:45 PM	JONATHAN COHEN	TBA

ABSTRACTS

Peter Balsam; Barnard College and Columbia University

Construal in associative learning

Individuals construe situations differently. The same individual can construe the same situation in different ways at different times. Our formal theories typically assume that there is one "true" way in which experiences are construed. In the case of associative learning theories, it is often assumed that animals construe the world as a series of discrete events (e.g. A conditioned stimulus is paired with an unconditioned stimulus). Other theories assume that the temporal structure of experience guides behavior (e.g. Conditioned responding is based on rates of reward). Our experiments demonstrate that subjects do not always construe the world in the same way as experimenters and theorists. Additionally, how subjects construe an associative learning experiment is flexible and dependent on experience.

Moshe Bar; Bar-Ilan University, and Massachusetts General Hospital

Progression as a path to longevity

Three behavioral strategies have independently been shown to improve wellbeing: physical exercise, behavioral activation, and the facilitation of mental movement. It is proposed here that their corresponding benefit emanates from the same principle: progression. In physical exercise, predominantly aerobic, the progression is bodily; in behavioral activation, as used in clinical psychology when treating mood disorders, the progression is of action; and in the facilitation of mental movement, the progression is of thought and the semantic scope that it covers. The hypothesis put forth here is that subjective wellbeing, reward and improved mood incentivize progression-related behavior, and that such behavior drives both vitality and longevity.

Diane M Beck; Illinois University

Neurally-guided deep neural nets support a hierarchical disentangling of category manifold across the human visual cortex

Human recognition is resilient to many identity-preserving transformations of an image, whereas computer vision is surprisingly brittle. Theoretical work proposes that such resilience is the result of successive disentangling of category manifolds by the ventral visual cortex. To investigate this hypothesis, we trained deep convolutional neural nets to align their representations with human neural responses from consecutive ventral visual regions during visual tasks. We show that not only do these neurally-guided models exhibit robustness improvements, but alignment to higher-order VVS regions yielded greater gains and more desirable manifold properties.

Sudeep Bhatia; University of Pennsylvania

Search through memory structure

Abstract: Semantic memory encodes both the individual features of concepts and the relations between them. We develop computational memory models that describe how people search through these memory structures. Our empirical paradigm involves open-ended word-pair analogy generation and free association tasks, and we infer the respective roles of featural and relational information in these tasks using formal model comparisons. Our tests reveal that both types of information play a key role in memory search, but they are recruited differently depending on the task and exhibit distinct dynamics. Importantly, we can quantitatively predict these effects and parameterize their associated mechanisms using a principled extension of established memory models, thereby integrating theoretical work on structured reasoning and on memory search.

Jerome Busemeyer; Indiana University

Using quantum probability to understand contextual reasoning

What kind of logic do people use to reason about natural events? What kind of probability theory best describes how people make inferences and decisions under uncertainty? I will review empirical evidence from a variety of domains that demonstrate the contextual nature of our reasoning and decision-making processes. This includes empirical examples from attitude surveys, membership judgments, categorization decisions, probability estimates, preferential choices, and risky decision-making. These findings are difficult to explain using classical logic and Bayesian probability theory. Although various heuristics have been proposed to account for these findings, they turn out to be ad hoc, unsystematic, and even inconsistent. Quantum probability is an alternative, and completely general, probability theory, which is based on different axioms that Bayesian probability. I will show that quantum probability theory provides a simple, systematic, and coherent way to understand the contextual nature of human reasoning.

Marisa Carrasco; New York University

TMS reveals a cortical double dissociation between endogenous and exogenous covert spatial attention

Psychophysical studies have established that both endogenous (voluntary) and exogenous (involuntary) covert spatial attention enhance visual sensitivity, yet these enhancements differ in their temporal dynamics and computational signatures. fMRI research indicates that the two forms of attention recruit partially overlapping neural networks. However, because fMRI evidence is correlational, neurostimulation methods are required to establish causal involvement. Here, using transcranial magnetic stimulation (TMS), we investigated the causal roles of two regions implicated in both types of attention: early visual cortex (V1/V2) and the human homologue of the right frontal eye field (rFEF+).

We applied double-pulse TMS during an orientation-discrimination task while attention was manipulated using either informative central cues (endogenous) or non-informative peripheral cues (exogenous). By targeting TMS, guided by individual phosphenes and MRI data, to the cortical representation of either the target or the distractor, we isolated the contribution of each region to attentional modulation of visual sensitivity. We obtained psychometric contrast–response functions and analyzed sensitivity (d′).

Across both attention types and stimulation sites, TMS to the distractor representation produced response-gain benefits at attended locations and costs at unattended locations. Critically, however, a double dissociation emerged when TMS targeted the representation of the attended stimulus. Disruption of V1/V2 selectively abolished exogenous, but not endogenous, attention effects, whereas disruption of rFEF+ selectively reduced endogenous, but not exogenous, attention.

This double dissociation reveals that exogenous attention depends critically on early visual cortex, consistent with models positing automatic, stimulus-driven modulation at early stages of sensory processing. In contrast, endogenous attention requires rFEF+, supporting its role as a top-down control hub that biases sensory processing via feedback mechanisms. More broadly, these findings challenge accounts that consider endogenous and exogenous attention as differing only in degree or timing and bolster theoretical frameworks in which voluntary and involuntary selection are implemented by distinct neural mechanisms.

Randy Gallistel; Rutgers University

Leveraging deep neural networks to model human perceptual learning of robust object recognition

Context plays a critical role in associative learning, but no one has ventured to define it. I suggest that it is the minimal proper temporal superset for the event (CS) that predicts an increase in the rate of reinforcement. Three rates of reinforcement may be associated with a context: The rate attributed to the CS; the rate attributed to its container (the super-set) and the rate attributed to the dyad. Recent experimental results make this suggestion readily testable.

Morton Ann Gernsbacher; University of Wisconsin-Madison

Cognitive processes and mechanisms in comprehension

In this career-retrospective, I will first take us back to the late 1960s and early 1970s, when the nascent field of psycholinguistics was emerging. During this era, dominant traditions like Skinner's behaviorism and Chomsky's Universal Grammar ruled the roost – and largely overlooked the basic cognitive mechanisms and processes that might underlie language comprehension. I challenged these perspectives with an approach I called the Structure Building Framework. According to the Structure Building Framework, three general cognitive processes facilitate understanding: laying a foundation, mapping coherent information, and shifting to new structures. Two general mechanisms govern these cognitive processes: suppression of irrelevant information and enhancement of relevant information. I have used the Structure Building Framework to explain phenomena previously assumed to be only the purview of language-specific processes (e.g., surface information loss, pronoun resolution, word order, figurative language, determiner semantics) as well as to describe individual differences in comprehension skill and other applied phenomena (e.g., simultaneous interpretation, the inverted pyramid in journalism, and language loss). The Structure Building Framework has also been robust in identifying the commonalities of comprehension across multiple media beyond text and speech (e.g., nonverbal picture stories). At one point, I got attracted by another shiny object, autism, and in this presentation, I will share how that putative detour became a decades-long inquiry that led me back to the same general cognitive processes I'd been studying all along.

Robert Goldstone; Indiana University

How does the distribution of shapes affect their perceived relative similarity?

In the phenomenon of categorical perception, people and other animals are better at discriminating between objects that straddle a category boundary than objects that fall into a single category, even equating physical differences between stimuli. This effect is still shown with novel categories that are inductively learned with feedback within an experimental session. In the current study, we ask whether the categories might even be only implicitly present in the "clumpy" distribution of stimuli. Accordingly, we created morph sequences of 14 animal shapes spanning two animals. Participants either made similarity judgments among the entire sequence of 14 morphs (Chain) or with the middle two morphs (e.g. 7 and 8) removed (Isolated). Participants judged shapes that straddled the category boundary (e.g. 6 and 9) to be relatively less similar than shapes within a category (e.g. 3 and 6), and this difference was significantly larger for the Isolated than Chain condition. These differences are also captured by machine learning techniques that create unsupervised low-dimensional embeddings of data such as PHATE. Both humans and PHATE interpret the world in terms of emergent categories that are implicitly defined by the structure of the stimulus space even without explicit category labels or feedback.

Tom Griffiths; Princeton University

Bayes in the age of intelligent machines

Recent rapid progress in the creation of artificial intelligence (AI) systems has been driven in large part by innovations in architectures and algorithms for developing large scale artificial neural networks. As a consequence, it's natural to ask what role abstract principles of intelligence — such as Bayes' rule — might play in developing intelligent machines. In this talk, I will argue that there is a new way in which Bayes can be used in the context of AI, more akin to how it is used in cognitive science: providing an abstract description of how agents should solve certain problems and hence a tool for understanding their behavior. This new role is motivated in large part by the fact that we have succeeded in creating intelligent systems that we do not fully understand, making the problem for the machine learning researcher more closely parallel that of the cognitive scientist. I will talk about how this perspective can help us think about making machines with better informed priors about the world and give us insight into their behavior by directly creating cognitive models of neural networks.

Keith Holyoak; University of California, Los Angeles

Metaphor is more than analogy

The psychological relationship between metaphor and analogy has been the focus of continuing controversy. Using both production and comprehension paradigms, we investigated processing of metaphors versus formally equivalent analogies. To precisely match the metaphor and analogy tasks, we generated materials based on Aristotelian metaphors, derived by translating proportional verbal analogies in the form A:B::C:D into metaphors in the form "A is the C of B" (omitting the D term). For both analogies and metaphors, we had participants rate their goodness, produce expressions, and select the best completion. People assigned higher goodness scores to analogies and metaphors that were relationally valid. But although a valid analogical basis proved necessary to create a successful metaphor, this was not sufficient. We found that good metaphors honor additional pragmatic constraints predictable from a set of lexical variables related to word generalness and familiarity. Our findings demonstrate both formal commonalities and pragmatic differences in the processing of metaphors and analogies.

John Hummel; Illinois University

A computational phylogenesis of intelligence, biological and artificial

Human cognition differs from that of other animals and from current approaches to AI. All animals can successfully navigate novel environments, and many can make and use tools. However, humans are the only animals known to create and use complex tools, including abstract tools such as mathematics and logic. Many (possibly all) animals represent the important properties of their environments as invariants and bind those invariants together dynamically using synchrony of neural firing. These capacities are also necessary but not sufficient to form the symbol systems characterizing complex human thinking. In a series of simulations we demonstrated that, in addition to dynamic binding of invariants, (a) the capacity to compose multiple such bindings into multi-place predicates (i.e., relations) and (b) the capacity to map systems of such predicates onto one another are both necessary and sufficient to support complex relational reasoning of the kind that characterizes human thought. All four of these capacities—representing invariants, dynamic binding of invariants, composition of multiple bindings into relations, and mapping systems of such relations onto one another—are present in human cognition and absent in modern approaches to AI. We argue that this absence accounts for the major limitations of AI, especially its reliance on enormous amounts of training, which is responsible for its massive ecological footprint.

Michael Kahana; Nia Therapeutics

A theory of memory for items and associations (CMR-IA)

We present a retrieved-context theory of memory for items, associations, and their interaction (CMR-IA). Our theory assumes an evolving representation of temporal context that binds to items and associations, allowing the rememberer to make judgments based on the occurrence of a mnemonic target within a particular context. In addition to the assumptions inherited from prior retrieved-context theories, CMR-IA assumes a conjunctive (Gestalt) representation for paired associates, increased attention to rare items, and variable thresholds for recognition decisions. We apply CMR-IA to key findings concerning recognition of items and associations, including effects of recency, similarity, receiver-operating characteristic curves, word frequency, differential forgettings of items and associations, and contiguity effects for successive probes. We also apply CMR-IA to cued recall phenomena, including serial position effects, distribution of correct responses and errors, contiguity effects, associative symmetry, and similarity effects. Finally, we ask whether CMR-IA can account for the dependencies between successive tests of item and associative memory. We show that combining a Gestalt associative mechanism with retrieved-context theory provides a good account for many empirical phenomena concerning item and associative memory. The analysis of successive memory tests highlights the important role of output encoding in our model.

Philip Kellman; University of California, Los Angeles

From neural units to constant curvature representations of contour shape

How does visual processing transform early encodings—transient responses of orientation-sensitive units—into more durable, symbolic representations of object boundaries and shape? Recent research provides clues about how this transition occurs in contour and two-dimensional shape perception. Evidence suggests that an initial symbolic representation of contour shape may consist of segments of constant curvature (Baker, Garrigan, & Kellman, 2021). We hypothesize that these representations arise from banks of curvature filters ("arclets") built from oriented units linked by constant turning angles (Kellman, et al., 2013; c.f., Poirier & Wilson, 2006). Arclets span multiple turning angles and scales; collectively, they extract from smooth contour input a

representation consisting of constant curvature segments. Baker & Kellman (2021) developed a computational model supporting the plausibility of the approach and its agreement with psychophysical data. Here, we describe a neurally plausible model that operates directly on simple images and produces a symbolic encoding of 2D contours and shapes in terms of constant curvature segments. Each arclet unit is built from combined outputs of three co-circular, odd-symmetric, Gabor filters. In this initial neural model, we use 6 scales with 6 positive and 6 negative turning angles, plus a zero turning angle, per scale. Filled 2D shapes on homogeneous backgrounds are convolved with each filter type, and activations--normalized relative to maximum possible responses--are found for the best fitting arclet position of each type. Arclets with different turning-angle and scale combinations compete to capture local contour segments into curvature bins spaced to be consistent with human sensitivity to curvature differences. Initial tests indicate that the model outputs agree well with human perception, even for arbitrary shapes lacking any constant-curvature parts. Encoding with curvature filters into bins of scale and turning angle yields a scale-invariant shape code that provides a natural account of the ease with which perceivers detect shape similarity despite differences in size.

Peter Killeen; Arizona State University

Lotteries

Some of the outstanding problems in behavioral economics concern choice between lotteries, each involving probabilistic outcomes of one or another goods. Kahneman and Tversky demonstrated how decisions in these contexts systematically deviate from those predicted by traditional economic theory. But whereas their Prospect Theory discredited expected value models and sketched an alternative, that alternative did not solve the problems that they identified. By using conjoint measurement to determine the utility function for money (linear-logarithmic) and the subjective probability function (Prelec's), the present approach solves those problems, accurately predicting modal preferences in all of their "paradoxical" lotteries; the results of probability discounting in general. It accounts for the many named anomalies, such as the Allais paradoxes and certainty effects and framing effects and magnitude effects with one coherent set of theoretical models, providing coherent explanations of why the anomalies occur.

Robert Knight; University of California, Berkeley

Orbital Frontal Cortex and Human Behavior

The orbitofrontal cortex (OFC) has fascinated clinicians and researchers since the classic case of Phineas Gage in 1848. Clinical observation of OFC patients highlights disruption in social regulation and basic neuroscience documents involvement in reward processing. Here we use intracranial EEG to assess the role of human OFC in approach-avoidance know to be disordered in numerous neuropsychiatric conditions including generalized anxiety and depression.We first used a variant of the PacMan game to assess the role of limbic structures including amygdala, insula, anterior cingulate and OFC in approach-avoidance. As PacMan gobbled targets, limbic theta activity increased with OFC coordinating network activity. As the Ghost began to attack PacMan, limbic theta rapidly dropped and high frequency activity (HFA; 70-150Hz) emerged in lateral prefrontal cortex commensurate with PacMan withdrawal. We then recorded high density OFC activity in a second approach-avoidance experiment, the Rubies Task. Here subjects navigated a hallway that was populated with bombs along the hallway and chests with rubies in chests at the end of the hallway. We varied the number of bombs or ruby chests in each trial. We observed a gradient of approach and avoid activity in OFC indexed with HFA. Medial OFC HFA was enhanced during approach trials and lateral OFC HFA was enhanced in avoid trials in a push pull manner. These findings reveal how OFC enables a central human behavior and provide targets for neuromodulation of severe anxiety and depression.

Barbara Knowlton; University of California, Los Angeles

Assessing behavioral control across the adult lifespan using a novel outcome revaluation task

While many studies have investigated the effects of aging on cognition, relatively few have examined aging impacts on habitual behavioral control. To assess these relationships, 151 adults across the lifespan (aged19-80) completed a novel instrumental outcome revaluation task, where participants made keyboard responses to abstract stimuli to gain digital currency before completing a revaluation test where the outcome of one stimulus was negatively altered while the other retained its value. Participants also completed questionnaires relating to psychiatric symptoms. Habitual responding was measured in terms of the response rate to the revalued stimulus relative to the response rate to the stimulus that was not revalued. There were significant positive effects of obsessive-compulsive symptoms and a modest effect of chronological age on habitual behavior These results indicate subtle changes in behavioral control across the adult lifespan and support previous work showing that certain psychological measures including obsessive-compulsive symptoms are associated with increased habitual responding.

Barbara Knowlton; University of California, Los Angeles

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Barbara Landau; John Hopkins University

Geometry and force dynamics in simple spatial terms: Two theories, one resolution

Understanding the foundations and acquisition of basic spatial terms in English and other languages requires consideration of which spatial properties might be universal, and which might be subject to significant variation across languages. I argue that progress can be made on these issues by recognizing two distinct subclasses of spatial terms, each rooted in qualitatively different kinds of properties and leading to different kinds of learning problem for the child. Although researchers have weighed in on both classes, they have rarely compared the two in terms of their underlying foundation, likely mechanisms of acquisition, and relative difficulty for acquisition.

Tania Lombrozo, Princeton University

The psychology of inconsistent beliefs: recognizing, reconciling, and revising

Do people hold inconsistent beliefs? If so, how do they arise, and how are they revised or maintained? In this talk I'll present collaborative work with Joseph Sommer investigating (in)consistency in belief. Both philosophers and psychologists have noted the serious theoretical and practical problems that can arise from holding inconsistent beliefs, yet they are commonly (if anecdotally) assumed to be widespread. We first provide systematic evidence for "synchronic inconsistencies" — inconsistent beliefs that are held at the same time. We then consider possible mechanisms by which inconsistent beliefs could arise and be maintained. We find evidence for at least two distinct mechanisms: inconsistent beliefs can arise and persist when they are not simultaneously accessible in memory, and inconsistencies can be maintained through a process we call "reconciliation reasoning," which is more common for motivated beliefs (e.g., about politics) than for beliefs concerning trivia.

Hongjing Lu; University of California, Los Angeles

Perception of social actions: A latent force model

Force is often used as a metaphor in describing social relations between people. We say certain people have a "gravitational pull" that draws others toward them. Conversely, when two people clash, we say they "repel" one another. Here, we show that force not only plays a metaphorical role, but actually serves as a computational primitive in the visual system to support social perception. A latent force model is proposed, in which repulsive and attractive forces undergo dynamic compositions and transitions over time, to capture both interactive forces linking agents and self-propelled forces based on individual intent. Three experiments were conducted to measure similarity judgments and recognitions of various interaction animations. We found that the latent force model provides a good account of human judgments, outperforming baseline kinematic models. Furthermore, the model exhibits generative capabilities, synthesizing new social animations that humans reliably recognize. These findings suggest that the visual system does not treat social and physical domains as entirely distinct. Rather, social perception and intuitive physics likely share a common set of computational primitives that operate in processing visual inputs.

Laurence Maloney; New York University

Allocating resources across time

Typical experiments concerning decision under risk share a common structure. The participant makes a series of unconnected decisions presented in randomized order. Early success or failure does not alter the participant's potential winnings in later trials.

In contrast, the participant in a cumulative allocation game (CAG) begins with a small endowment of wealth, and his goal is to increase this wealth as rapidly as possible by repeatedly investing a portion of it. For many CAGs, expected wealth can grow exponentially but – if wealth ever goes to zero – the game is over and the participant wins nothing ("ruin"). CAGs can be used to model a wide range of biological and economic activity from animal foraging to stock market investment. There is little research concerning human performance in CAGs.

In two experiments participants completed four CAGs. Initially, human players chose proportions to bet that maximized their rate of growth (normative performance) but, in the main experimental conditions, they gradually decreased their proportion bet by almost a factor of two over the course of the experiment. This reduction in proportion-bet decreased their expected rate of growth by roughly 25%.

Why would participants systematically abandon a normative strategy? A possible reason is loss aversion. Following the normative strategy will result in the highest expected growth rate but the participant will experience large trial-to-trial fluctuations (volatility). Because of loss aversion losses impact the player more than gains of equal absolute magnitude and this asymmetry may drive the gradual reduction in proportion bet we observed. If so, loss aversion links classical decision under risk with CAGs. We further show that while loss aversion in decision under risk is sub-optimal, there is an intrinsic asymmetry between losses and gains in CAGs that could explain the loss aversion we observe.

Barbara Mellers; University of Pennsylvania

Reference-point theory: AI-assisted adversarial collaboration

Disputes are central to scientific progress, but their resolution can be difficult. Adversarial collaboration offers a powerful but under-explored method for addressing scientific debate. We offer proof of concept that an AI-assisted adversarial collaboration can help resolve a debate about minority salience. This exercise led to preregistered experiments that clarified the dispute and produced solid evidence in one direction. Furthermore, after the experiments, beliefs about the hypotheses of opposing research teams converged, leading to scientific consensus. AI did not replace humans or determine the final experimental designs. But it clarified the disagreements and set the stage for the design of experiments that yielded sufficiently compelling results to produce agreement between proponents and skeptics of the robustness of minority-salience effects.

Ralph R Miller; State University of New York at Binghamton

Effects of event frequency as a function of directly and indirectly experienced events

Abstract: In our distant evolutionary past, humans learned about relationships between stimuli and/or response occurrences exclusively from direct experience (a learning event). Recurrences of the learning event (i.e., increasing event frequency) provided evidence that the initially experienced learning event was not spurious. This simple mechanism remained highly effective until the development of language compromised it about 130,000 years ago. Language permitted a single occurrence of a relationship to be heard about repeatedly. I suggest that humans never developed an ability to fully discount from event frequency multiple reports of the same event. The advent of written language 6,000 years ago, and particularly the printing press 600 years ago, which facilitated literacy, greatly increased humans' being repeatedly exposed to multiple reports of the same event. In more recent times, radio, television, and now digital media have further increased the extent to which people are exposed to repeated reports of a single event. People are poor at discounting repeated reports of the same learning events, particularly when the reports are not identical in sensory form (i.e., when they are paraphrased or have different narrators). Scientists as well as laypeople are subject to this erroneous inflation of subjective event frequency. ... This view is no more than a rough hypothesis. I will present no new data, but will cite select phenomena in the existing literature as post hoc support (e.g., the repetition-induced truth effect).

Nora Newcombe; Temple

Spatial perspective taking is distinct from cognitive and affective perspective taking

Adopting another's perspective is thought to be important for navigating spatial and social scenarios, predicting the behavior of others, and planning future actions. However, it is not yet understood if perspective taking (PT) in different domains, such as the abilities to imagine what others see (spatial PT), think (cognitive PT), and feel (affective PT), form a singular behavioral dimension, or rely on common neural mechanisms. I will present behavioral and neural data indicating that spatial and social forms of PT are largely distinct constructs, with low correlations across behavioral measures and separate functional neural correlates.

Mary A Peterson; University of Arizona

Ambiguity and reentrant processing in object detection

Many scientists continue to conceive of object detection as occurring in stages that map onto levels in the visual hierarchy. I will review experiments suggesting that multiple interpretations and their semantics are activated at high levels before conscious object detection. That more than one interpretation is activated before object detection implies that ambiguity (and not just uncertainty) exists before conscious object detection. This is so even when displays seem unambiguous after detection. Converging evidence from a variety of methods supports this view and suggests that reentrant processes— both cortico-cortical and cortico-subcortical—determine conscious perception. Stage terminology is outdated.

Russell A. Poldrack; Stanford

Experimenters and correlators become one: Revisiting Chronbach's two disciplines

Abstract: In 1957 Lee Chronbach described "two disciplines of scientific psychology", comprising the experimenters and the correlators. The experimentalist and SEP member Jack Hilgard notably referred to correlation in 1955 as "an instrument of the devil". In the last few decades, however, experimenters have regularly made deals with Hilgard's devil, and individual difference analyses are increasingly common in cognitive psychology/neuroscience. I will outline some of the insights that have come from combining experimental and individual difference methods, as well as ways in which modern causal inference methods from other fields can help address some of the inferential limitations of correlational studies.

Valerie Reyna; Cornell University

A fuzzy trace theory of vaccination behaviors and intentions: The case of influenza

Although viral outbreaks are increasing, vaccination rates are decreasing. Our aim was to explain this baffling behavior that seems to contradict rational self-interest, and, thus, be beyond the purview of rational choice theories. We integrated fuzzy-trace theory and major theoretical alternatives and applied them to influenza, testing theoretical predictions in two samples: young adults (who are major viral vectors), N = 722, and community members, N = 185. Controlling for prior knowledge and other psychosocial factors that influence vaccination, explained variance jumped significantly when key predictors from fuzzy-trace theory were added, reaching 62% and 80% for vaccination intentions and 37% and 59% for behavior for each sample, respectively. Single items assessing global gist perceptions of risks and benefits achieved remarkable levels of diagnosticity. Key predictors were intuitive in that they were gisty, imprecise, and non-analytical. In contrast, rational system 2 measures—numeracy and cognitive reflection—were not predictive. These results provide new insights into why individuals vaccinate or not and new avenues for interventions to improve shared clinical decision-making.

Henry L. Roediger, III; Washington University in St. Louis

The Power of Study and Test Trials in Learning and Retention

The standard view in education and cognitive psychology is that we learn through studying and that tests are given merely to measure what we have learned. Research in the past 30+ years has changed this view. Retrieving information from memory can have a powerful positive effect on learning. I present three experiments examining the relative power of studying versus testing for learning and retention. The results show that retrieval can often have a much more powerful effect on learning and retention than studying. The results bear important implications for education.

Richard Shiffrin; Indiana University

A model for recognition accuracy and RT based on feature collection

In research recently submitted to Psychological Review we showed that the simple three parameter REM model of OLD/NEW word recognition (Shiffrin & Steyvers, 1997) could predict well without change and with its old parameters choice accuracy in 288 new and different conditions in three new studies that tested old/new recognition for single item tests and also presented two items at a time for two new tasks: 2AFC — choose the more likely OLD item (or the more likely NEW item) — or 4WC — classify the two items as both OLD, both NEW or one of each (and which). The tasks varied list length, words or pictures or mixed lists of both. One new parameter was needed to account for better picture recognition. The studies also collected response times in every condition. Here we present just a few highlights of a new type of evidence accumulation model based on REM to account jointly for accuracy and response time. The model uses the time to sample features from the test item, or from the two test items, as a major component of the predicted RT: As each new feature is sampled the REM evidence is assessed. For old/new decisions a response is made if the evidence exceeds either an OLD or NEW boundary (that converges as sampling continues). For 2AFC a response is made if the difference in the evidence for the two choices exceeds a single boundary that converges as time passes.

Steven Sloman; Brown University

The cost of conviction

When choosing, do we consider the best outcomes or prioritize our deepest values about what action to take? Do we frame issues consequentially or in terms of sacred values? The two frames have different formal justifications, but my focus will be on their different psychological implications. Simplicity and communicative ease often lead us to sacred value frames when consequentialist frames would make big problems more tractable. I will report studies showing that, relative to consequentialist frames, sacred value frames reduce people's willingness to compromise, make them more vulnerable to outrage, and increase their willingness to act. Sacred value frames, I argue, are an important contributor to extremism and polarization.

Herbert Terrace; Columbia University

What is a word?

It is generally agreed that language is uniquely human, but it's unclear if that's true for both grammar and words. For example, some scholars have argued that other species, e.g., chimpanzees, use words. That issue cannot be resolved without a clear definition of a word, a definition that's been elusive. Here, I define a word as an arbitrary utterance that can be used conversationally. This definition rules out individual utterances such as yawns, exclamations, and imperatives. The latter is important because it rules out imperative gestures that chimpanzees learned in "ape language" experiments. If imperatives were the only form of communication our ancestors could use, language would never have evolved. "Conversational" utterances are declarative. Their function is to transmit knowledge for its own sake. This definition also helps define protolanguage, a form of communication consisting of declarative utterances that are not constrained by grammatical rules. Its role is to reduce the gap between animal communication and grammatical language, a gap that seems too large to be accounted for by natural selection. Protolanguage poses some intriguing questions. Was its form vocal or gestural? How did the protolanguage evolve in an environment that lacked cultural support for language? At what stage did utterances in protolanguage achieve lexical status, that is, the ability to be combined with other utterances?

Frank Tong; Vanderbilt University

Leveraging deep neural networks to model human perceptual learning of robust object recognition

How does the human visual system cope with challenging viewing conditions such as those involving noise, blur, or other forms of ambiguity? One possibility might be that the system's inherent architecture confers robustness. Alternatively, robustness may be acquired via perceptual learning, but in a manner that has previously eluded direct characterization due to the complexity of the visual tasks and underlying mechanisms involved. Here, I will discuss the ecological learning hypothesis, which predicts that the robustness of human vision is acquired via learning from prevalent encounters with challenging viewing conditions, such that DNNs trained with similar challenges should become more robust and human-aligned. We show that humans tasked to recognize either animate or inanimate objects in Gaussian noise show significant improvements in their noise recognitions thresholds after extensive training, in a manner that generalizes to novel object images but only for the trained category. When DNNs are trained with the same sets of noisy object images, we observe parallel effects of category-specific learning. A layer-specific analysis revealed that category-general improvements in noise robustness emerged in lower layers of the DNN, whereas category-specific improvements occur in the higher layers. We conclude that deep neural networks can serve as informative models for characterizing the representational changes that occur during human perceptual learning in complex tasks of object recognition.

James Townsend; Indiana University Bloomington

The neural efficiency score: Quantifying the relationship between work accomplished and energy expended using response times and EEG

The brain expends energy in the performance of mental work but there have been limited attempts to empirically link measures of cognitive work with measures of energy expended. We previously suggested that the hazard function of the reaction time (RT) distribution, h(t), can be interpreted as an instantaneous measure of the amount of work being performed. We here suggest that the global field power (GFP) of electroencephalographic (EEG) data can be interpreted in terms of brain energy expenditure. Forming a ratio of h(t) and the GFP gives a ratio that we refer to as the neural efficiency score (NES). We used the RTs from trials on which correct responses were made to estimate h(t) and we used the EEG data from the same trials to calculate the GFP. We found that h(t) was reliably higher for IS than for IDNA women but converged for the longest RTs, suggesting, IS women were accomplishing more work than IDNA women. This ordering was reversed in the GFP data, suggesting that IDNA women were expending more neural energy to accomplish their perceptual work than were IS women. Combining these variables in the NES showed that IS women had a higher level of neural efficiency than did IDNA women and this was true across the range of RTs.

Elke Weber; Princeton University

Query theory: A process account of constructed judgments or preferences

Many psychologists and behavioral economists agree that many of our preferences are constructed, rather than innate or pre-computed and stored. Little research, however, has explored the implications that established facts about human attention and memory have when people marshal evidence for their decisions. This talk reviews query theory, a psychological process model of preference construction, and uses it to explain a range of phenomena in intertemporal choice, including our impatience when we are asked to delay consumption, applied to both clinical and normal populations. Experimental data, meta-analyzed across multiple contexts, provide support for query theory's assumptions about the processes underlying preference construction.

Jeremy Wolfe; Harvard University

I don't know when to quit: The problem of search termination

Quitting is a long-standing problem in visual search. How do you know when it is time to end a search if you have not found anything or if you don't know how many targets can be present? For many years, various versions of the Guided Search model have proposed an adaptive process. If you get the right answer, you can quit a little sooner next time. If you get the wrong answer, slow down. The parameters of this staircase can be adjusted to produce asymptotic behavior yielding a desired error rate. This works quite well and other models have adopted similar rules. However, this staircase method assumes that you are performing many instances of the same search. In the real world, you do not search for a ripe mango 200 times in a row with feedback. How do you decide that this bin at Whole Foods does not contain a ripe mango? I will describe new experiments where observers never look for the same target twice and where the difficulty of search can vary dramatically from trial to trial. These conditions do not produce wildly abnormal quitting behavior in RT or error rates. I will discuss how these results constrain the next generation of models of search termination.

INFORMATION

ALEXANDRA LEWIS	ON-SITE	732-616-6567
NASSAU INN	10 PALMER SQ PRINCETON, NJ	609-921-7500
GRADUATE BY HILTON	10 CHAMBERS ST PRINCETON, NJ	609-436-9400
A-1 LIMO	INFO@A1LIMO.COM	800-367-0070

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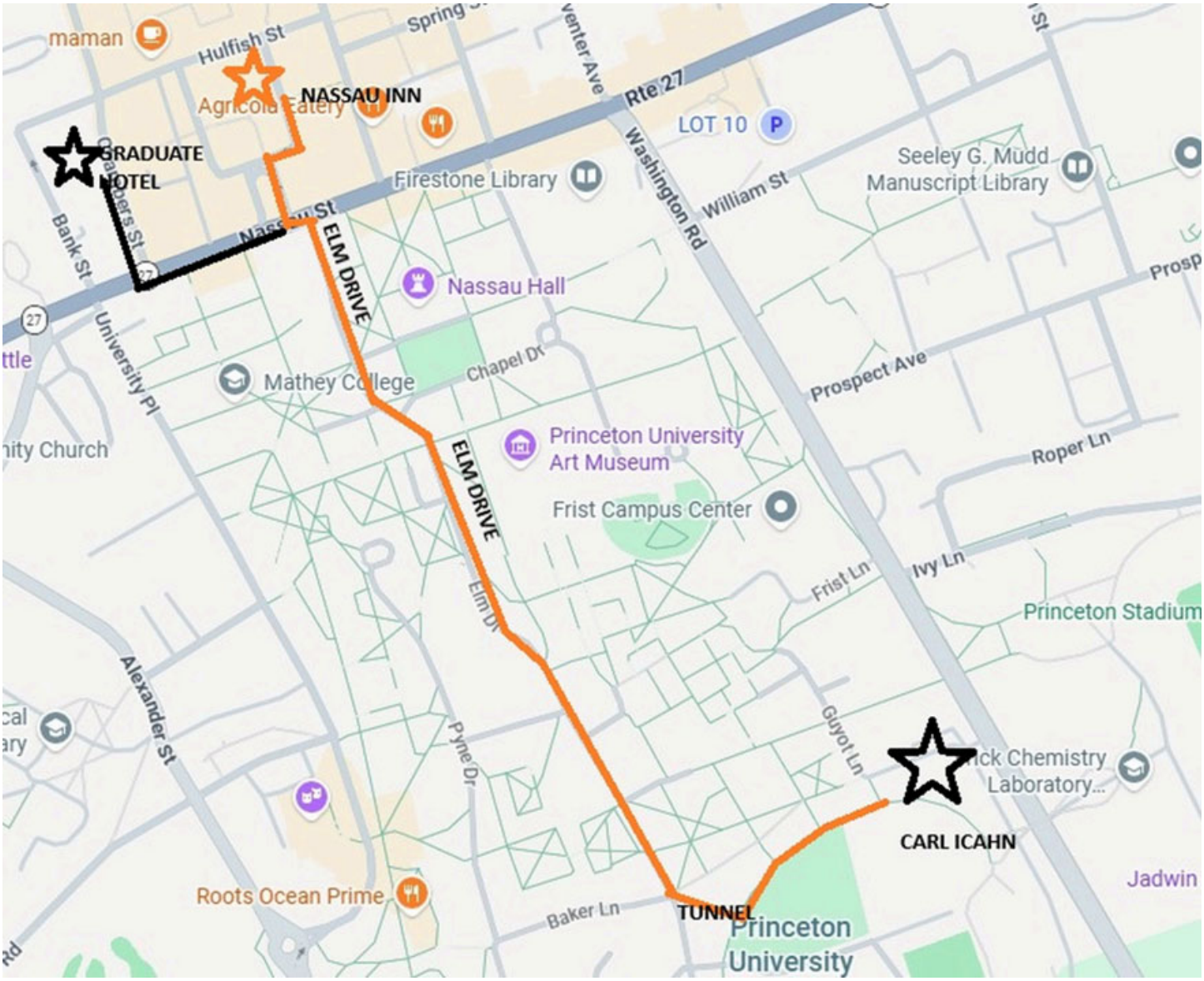
ICE CREAM: BENT SPOON * THOMAS' SWEETS
BAR SPOTS: TERESA'S PIZZA/ WINE BAR * ALCHEMIST & BARRISTER * AGRICOLA EATERY
CASUAL EATERY: TACORIA * MAMOUNS FALAFEL * OILIVES

MAPS

HOTELS TO CARL ICAHN LABORATORY



HEAD TOWARD NASSAU STREET – CROSS OVER TOWARD THE UNIVERSITY

MAKE A RIGHT ONTO ELM DRIVE AND TAKE THAT ALL THE WAY DOWN TO BAKER LN (ON YOUR RIGHT)

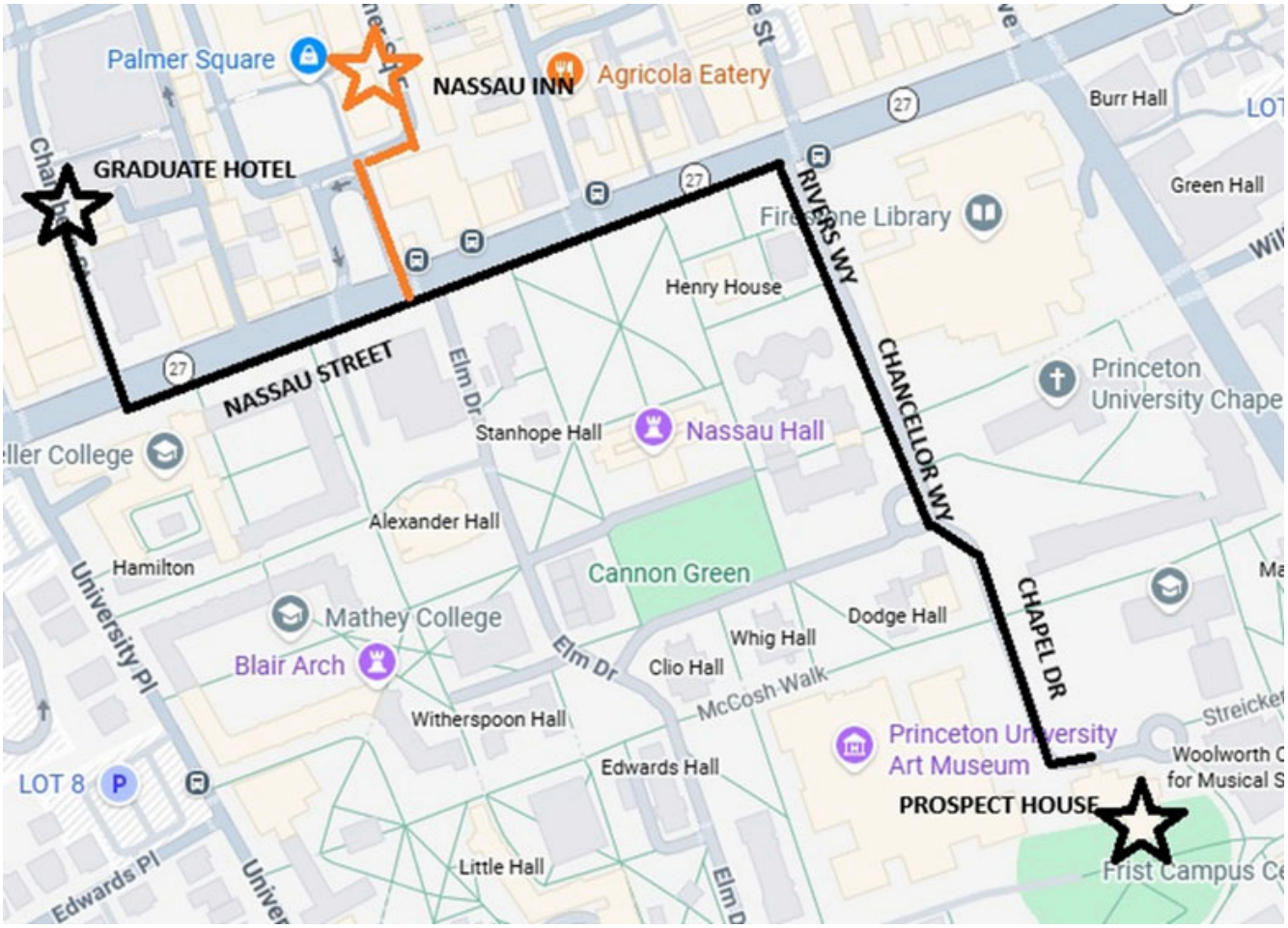
ON YOUR LEFT WILL BE BLOOMBERG HALL – KEEP LEFT ONTO TILGHMAN WALK AND GO THROUGH THE TUNNEL OF THE BUILDING

PAST THE TUNNEL MAKE A LEFT AND FOLLOW THE CURVED WALK ALL THE WAY TO CARL ICAHN LABORATORY

609-258-7731 sep.psychology.princeton.edu sepsych.org

MAPS

HOTELS TO PROSPECT HOUSE



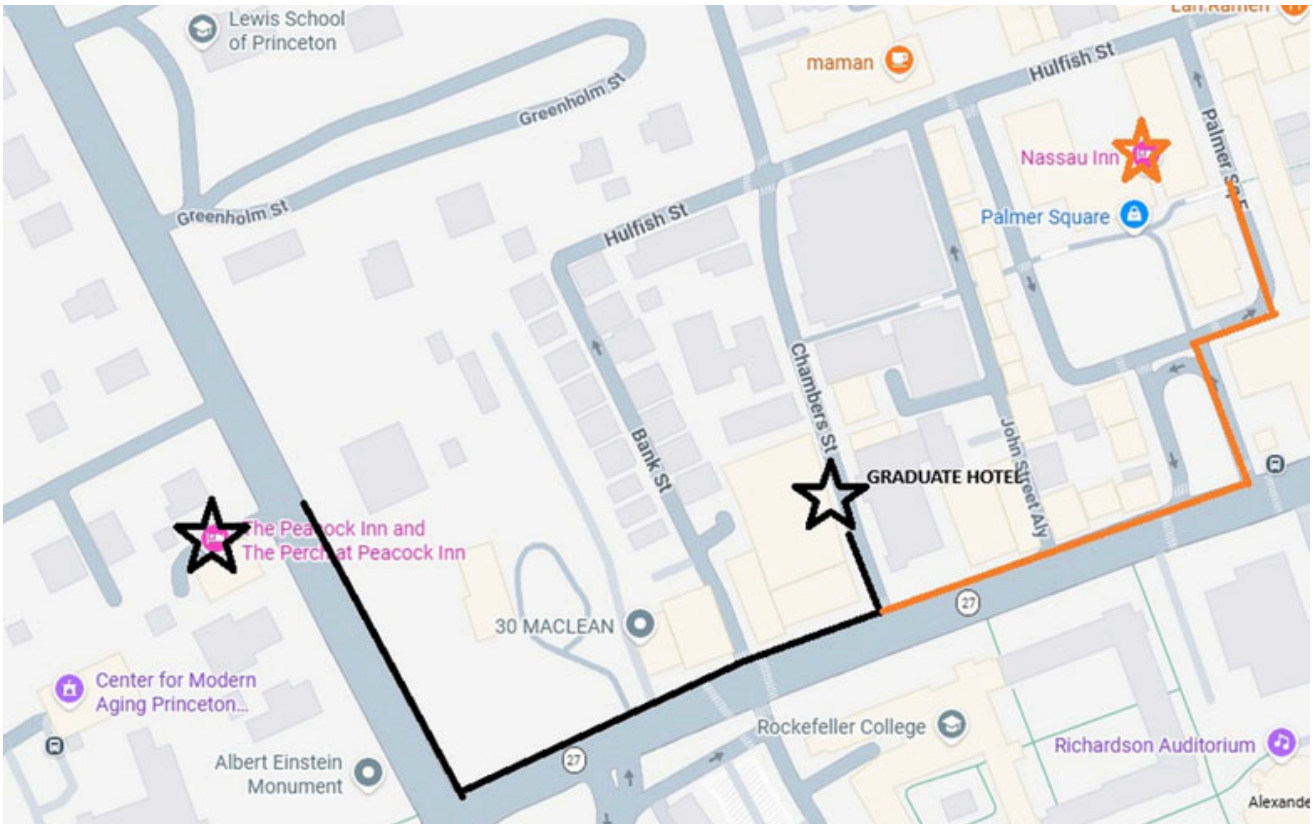
HEAD TOWARD NASSAU STREET – CROSS OVER TOWARD THE UNIVERSITY

MAKE A RIGHT ONTO RIVERS WAY WHICH WILL TURN TO CHANCELLOR WAY

KEEP LEFT ONTO CHAPEL DR

MAPS

HOTELS TO PEACOCK INN



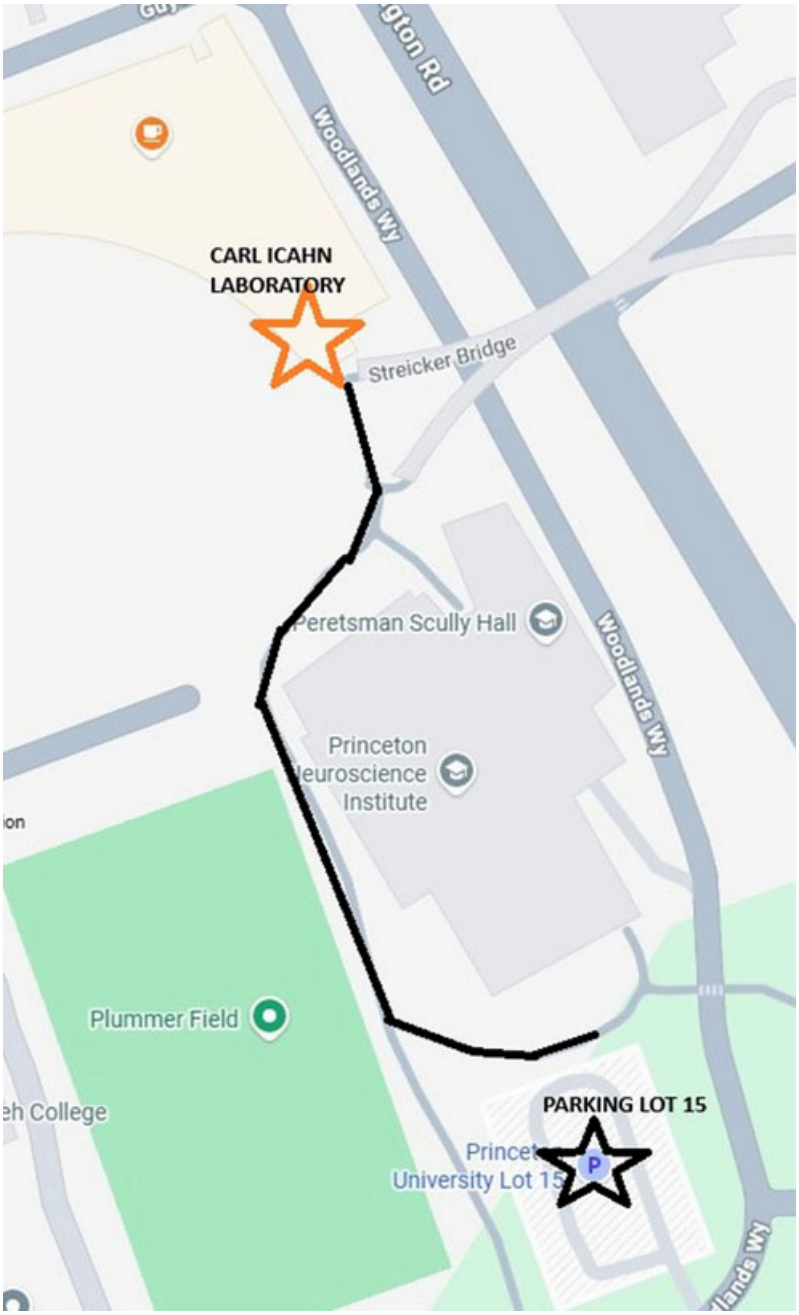
HEAD TOWARD NASSAU STREET – MAKE A RIGHT

MAKE A RIGHT ONTO BAYARD LANE

PEACOCK INN IS ON YOUR LEFT

MAPS

PARKING



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WALK TOWARD THE LEFT OF THE BUILDING – UPHILL

AFTER YOU PASS THE BUILDING KEEP RIGHT – YOU WILL SEE CARL ICAHN IN FRONT OF YOU

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