The Society of Experimental Psychologists

May 2022

Chicago, Illinois

London House Hotel

THURSDAY MAY 5			
5:00-7:30 PM Opening reception with heavy hors d'oeuvres			
FRIDAY MAY 6		**SATURDAY MAY 7**	
8:30-9:00	***Continental Breakfast***	**8:30-9:00**	***Continental Breakfast***
9:00-9:20	Zentall	9:00-9:20	Brainerd
9:20-9:40	Gallistel	9:20-9:40	Reyna
9:40-10:00	Kastner	9:40-10:00	Andrews-Hanna
10:00-10:20	Emmorey	10:00-10:20	Terrace
10:20-10:40	***BREAK***	**10:20-10:40**	***BREAK***
10:40-11:00	Killeen	10:40-11:00	Reder
11:00-11:20	Beck	11:00-11:20	Federmeier
11:20-11:40	Miller	11:20-11:40	Sperling
11:40-12:00	Kahana	11:40-12:00	Shiffrin
12:00-2:00	***Deli-style lunch***	**12:00-2:00**	***Deli-style lunch***
2:00-2:20	Cowan	2:00-2:20	Goldstone
2:20-2:40	Glenberg	2:20-2:40	Townsend
2:40-3:00	Zacks	2:40-3:00	Carrasco
3:00-3:20	**BREAK**	3:00-3:20	Nadel
3:20-3:40	Holyoak	**3:20-3:40**	**BREAK**
3:40-4:00	Brady	3:40-4:00	Piantadosi
4:00-4:20	Trueblood	4:00-4:20	Engle
4:30-4:45	**SEP group photo**	**4:30-5:30**	**SEP business meeting**
		7:00	**Banquet at London House**

All events will be in the Etoile Room of the London House Hotel

*Thanks to the University of Chicago Division of Social Sciences
for providing financial support for this meeting.

Thomas Zentall

Suboptimal Choice by Pigeons: An Analog of Human Gambling

Behavioral ecologists claim that animals should maximize reinforcement as they have evolved to be optimal foragers. Cognitive psychologists propose that humans engage in suboptimal, unskilled gambling (e.g., lotteries and slot machines) primarily for its entertainment value. Yet pigeons show a strong suboptimal preference for a 20% chance of a signaled 10 pellets of food over a 100% chance of a signaled 3 pellets of food. Similarly, pigeons prefer a 20% chance of a signal for reinforcement over a 100% chance of a signal for 50% reinforcement. It appears that with this task, choice is determined, not by the probability of reinforcement at the time of choice, but by the value of the signal for reinforcement following that choice, and the signal for the absence of reinforcement plays little role in that choice. To test this hypothesis more directly, pigeons were given a choice between a 50% chance of a signal for reinforcement and a 100% chance of a signal for reinforcement. Surprisingly, the pigeons actually showed a preference for 50% reinforcement over 100% reinforcement. It appears that choice in this task is determined not only by the value of the signal for reinforcement, but also by positive contrast between what is expected at the time of choice, 50% reinforcement, and what is sometimes obtained, a signal for 100% reinforcement.

Charles Gallistel

Bees Extract Map Coordinates from the Dance: A Reply to Bill Warren

It has been assumed for the better part of a century that foragers that follow the dance of a successful returnee learn only the rhumb line to the source (flying instructions). The Randolf Menzel group captured bees that had followed the dance, transported them to release locations hundreds of meters away in 5 different directions and radar tracked their vector flights and the ensuing search flights. The vector flights showed strong release-site specific perturbations. In the ensuing search, a majority of the displaced bees eventually made their way to toward the true source location. The reason the cognitive map hypothesis does not die is because it is true even for insects.

Sabine Kastner

Neural dynamics of the primate attention network

The selection of information from cluttered sensory environments is one of the most fundamental cognitive operations performed by the primate brain. This process engages a large-scale network that consists of multiple nodes distributed across cortex and subcortical regions. The lecture will discuss the temporal dynamics across the attention network with an emphasis on thalamo-cortical interactions using a comparative electrophysiology and neuroimaging approach of the human and monkey brain.

Karen Emmorey

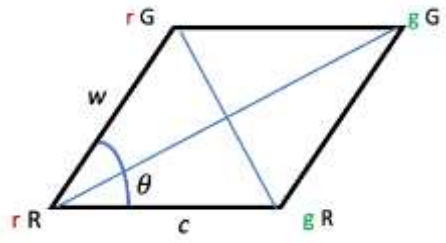
Turning languages on and off: Bimodal bilinguals reveal the nature of language control

When spoken language (unimodal) bilinguals switch between languages, they must simultaneously inhibit one language and activate the other language. Because ASL-English (bimodal) bilinguals can switch into and out of code-blends (simultaneous production of a sign and a word), we can tease apart the cost of inhibition (turning a language off) and activation (turning a language on). In addition, previous neuroimaging studies have associated language switching with increased prefrontal activity, but it is unknown how the subcomputations of language switching (turning on and off a language) individually contribute to these activations. Behavioral and MEG results from cued picture-naming tasks with bimodal bilinguals revealed a significant cost to turn off a language (switching out of a code-blend), but no cost to turn on a language (switching into a code-blend). Switching from single to dual lexical retrieval (adding a language) was also not costly. MEG data showed that turning a language off led to increased activity in the anterior cingulate cortex and dorsolateral prefrontal cortex, while turning a language on (switching from one language to two simultaneously) did not. Overall, these results suggest that the burden of language switching lies in disengagement from the previous language as opposed to engaging a new language and that, in the absence of motor constraints, producing two languages simultaneously is not necessarily more cognitively costly than producing one.

Peter Killeen

Trains, Planes, and Automobiles

Cartesian coordinates represent dimensions that do not interact: going up on one does not carry you left or right on the other. Most perceptual continuua interact: increasing the loudness of a tone increases its pitch: Going up moves you right. Non-orthogonal coordinates provide a natural map for such perceptual and response interactions. Relevant stimuli are placed at the vertices of a parallelogram, with the proximities to other vertices giving the competition for attention from other stimuli and responses in recent memory. This provides a good account of Garner, Stroop, and Erickson interactions. But this is only half the story: There are substantial sequential dependencies in these tasks. How to conjure those? By embedding the observer in the space. Measure the distance that must be travelled from the prior stimulus-response location to apprehend and respond to the current stimulus—the distance that the spotlight of attention must travel. Throughout, the obliquity of the perceptual parallelogram provides a continuous measure of the degree of interaction of the dimensions, its cosine the correlation between them. This geometric approach provides new pictures of many other dimensional interactions, including the repetition effect, the numerical distance effect, the Simon effect, and initialisms such as the CSE and DSE.



Diane Beck

Real-world Statistical Regularities and Vision

It has been known for some time that prior knowledge shapes our perception. Predictive coding posits that this prior knowledge takes the form of learned statistical regularities. I will describe evidence that real-world statistical regularities, i.e. regularities built up over lifetime, affect perception, and not just our ability to recognize images but to detect their presence. I will also show that, consistent with predictive coding models, statistically irregular images evoke more visual activity than statistically regular ones and this difference is context dependent.

Ralph Miller

Repetition-induced truth effect in psychological theorizing: Learning driven by prediction error' as a case study.

Social psychologists have found that people tend to believe information they hear repeatedly beyond the degree that is justified based on relevant evidence. Experimental psychologists are not immune to this effect. As a demonstration, I will examine the widely held view that 'learning is driven by an error between what is expected following a cue and what actually happens after the cue' (i.e., a prediction error). Old, well-replicated data diametrically opposed to this position will be presented, and how a focus on 'function' has misled thinking about 'process' will be considered. More generally, I will briefly discuss how scientific training makes conscious decision making normative, but has little impact on the subconscious information processing that often enters into our scientific conclusions. It is difficult if not impossible to exclude heuristics, biases, and habits from our scientific conclusions

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Michael Kahana

Remembering Bennet Bronson Murdock (1925-2022)

I will share some brief reflections on the life and scholarship of Ben Murdock, a towering figure in the psychology of human memory who has been a stalwart of SEP and a bulwark of experimental psychology. Ben was a champion of the dialogue between theory and data, and I will try to illustrate his research values and some of his unique perspectives on the science of memory.

Nelson Cowan

Multiple Item Repetitions in Lists for Serial Recall

Throughout the history of experimental psychology, there have been many studies of the serial recall of random lists. The vast majority of those studies involve lists with no repetitions of items; a few studies have introduced one repetition. In contrast, most lists in modern life can have multiple repetitions (phone numbers, social security numbers, etc.). Clearly, researchers have been afraid of the complexity introduced by multiple repetitions. For the first time, we tackled that complexity with multiple repetitions within printed, nine-digit lists. The lists were presented with spatial grouping (e.g., *863-442-858*) or with no grouping (e.g., *863442858*). We were able to identify principles by which repetition helped or hurt performance. Repetition helped when it reinforced the grouping that was presented, or when no grouping was presented but a mental grouping could be chosen by the participant to be consistent with the repetitions. Repetition hurt when the given grouping potentially conflicted with the placement of repetitions, or when repetitions caused a fan effect in which a single item was followed by different other items. The findings raise questions that are both theoretical (e.g., *Does it make sense to expect post-response item suppression when items can repeat?*) and practical (e.g., *Does the usual grouped presentation of long serial numbers serve the intended purpose, or is it counterproductive?*)

Arthur Glenberg
(with Cameron Jones)

Language Comprehension Requires Affordances

Abstract: Current large language models can do amazing tricks with language, but do they understand language the way humans do? Some embodied approaches to language comprehension suggest that language understanding requires the ability to use something akin to Gibsonian affordances that are likely beyond the scope of even the largest models because they do not have bodies that interact with the environment. Glenberg and Robertson (2000) demonstrated that the then-large model, LSA, could not predict human data. We report a replication of Glenberg and Robertson and show that the now-large model, GPT-3, with its 175 billion parameters, cannot predict the human data.

Jeffrey M. Zacks

Guidance of event comprehension by associative memory retrieval

An important function of episodic memory is to use information about recent events to guide predictions about current events. When things change, this can lead to errors, but also to opportunities for learning. I'll present a model of how episodic retrieval affects comprehension and memory updating. We have been testing this model in studies of young and older adults, combining memory testing with eye tracking and pattern-based fMRI.

Keith Holyoak, UCLA

Probabilistic Analogical Mapping with 3D Objects

I will give an overview of our recent work on computational models of analogical reasoning. The approach integrates deep learning (to convert raw inputs into vector-based representations) with a form of structured comparison based on attributed graphs. The basic model was developed to solve verbal analogies. Here I will focus on how the approach can be extended to infer analogical mappings between 3D objects.

Timothy Brady,
(with Annalise Miner, John Wixted & Mark Schurgin)

Shared Constraints on the Precision of Visual Working vs. Visual Long-Term Memory

Is working memory more 'precise' than long-term memory -- i.e., can people discriminate an item from a very similar item more accurately in working memory than for long-term memory? In this talk I will examine this using the new understanding of how memory strength results to precision of discrimination (Schurgin, Wixted & Brady, 2020). We measured continuous color report performance across a range of set sizes in working memory as well as a wide range of long-term memory strengths (manipulated via repetition). We find that the two memory systems are identical in their ability to discriminate subtle variations. In both systems, the ability to discriminate between similar items is driven by a single sense of memory strength, plus a fixed similarity structure of the stimulus space. This suggests that the documented differences between these two systems may not be due to a fundamental distinction between their representation, but rather due to a tendency to compare working memory to comparatively weak long-term memories.

Jennifer Trueblood

(with Quentin Eichbaum, Adam Seegmiller, Charles Stratton, William Holmes)

Combining Cognitive Modeling and Machine Learning to Understand Medical Image Decision-making

Most formal theories of human decision-making have been developed and tested using simplified laboratory tasks and are seldom used to study real-world decisions. One of the critical limitations for using computational cognitive models to study everyday cognition is that these models require quantitative representations of stimuli. In the past, obtaining representations of naturalistic stimuli has been challenging. In this talk, we will describe how machine learning models can be coupled with cognitive models to overcome this limitation and facilitate the study of everyday decision-making. We will illustrate this approach to study how the prevalence of abnormalities influences medical image-based decision-making. Over the past decade, it has been repeatedly demonstrated that extreme prevalence (both high and low) leads to an increase in errors. While this "prevalence effect" is well established, the cognitive and/or perceptual mechanisms responsible for it are not. We will use a joint deep convolutional neural network (CNN) and diffusion decision model (DDM) framework to explore how prevalence influences various cognitive mechanisms. Results show that the impact of prevalence is dependent on expertise, where prevalence impacts the perception of images in experts (medical laboratory professionals) and response bias in novices (students).

C. J. Brainerd

Non-compensatory Gist: Deep Distortions in Memory

A key test of any theoretical assumption is the prediction of new effects, especially counterintuitive ones. The assumption that we store gist representations of experience has been particularly productive, forecasting a series of illusions for both item and source memory that are called deep distortions. One example is overdistribution, wherein the sum of the probabilities of remembering that an item or a source detail belongs to a series of incompatible states exceeds the probability of remembering that it belongs to any of those states. A second example is super-overdistribution, wherein items are less likely to be remembered as belonging to a superordinate set than to its proper subsets. A third example is non-additivity, wherein the probabilities of remembering that an item belongs to each of a series of mutually exclusive states exceeds unity. A fourth example is impossible conjunctions, wherein subjects remember an item or a source detail as belonging to both of two logically incompatible states.

Valerie F. Reyna

Non-compensatory Gist: Decision Biases and the Zero Effect

Theories of decision making in economics and psychology assume that probability and outcome are compensatory in determining overall subjective value of an option. In contrast, fuzzy-trace theory assumes that gist representations that eschew compensatory processing dominate decisions among typical adults. Literal verbatim processing that is compensatory occurs in parallel. Complementing results with choice, I present research eliciting ratings of subjective values. The presence of zero in one option (but not the other) is crucial to predictions because it elicits categorical noncompensatory contrasts between options. Specifically, predictions of psychophysical models, such as prospect theory, are compared to the cognitive-representational approach of fuzzy-trace theory in which the presence or absence of zero is key. Experiments implemented a high-power design in which many problems were administered to large samples, who rated attractiveness of the certain or risky options. Violations of both strong and weak rationality were clearly observed in attractiveness ratings of individual options. However, truncation effects showed that these violations were conditional on the form of the decision problem. Truncation effects that involved adding or subtracting zero—

which should not matter in standard decision theories--showed that such rationality violations disappeared when zero was deleted, but were amplified when zero was emphasized, per predictions of fuzzy-trace theory. Thus, experimental manipulations induced compensatory (but verbatim) and noncompensatory (gist) processing. This is the first such demonstration using attractiveness ratings of certain and risky options. Results rule out the core mechanisms of standard theories but open the door to new ways of thinking about thinking. Applications to risky decision making about viral diseases will be discussed.

Jessica Andrews-Hanna

The Explorative Mind: Measuring the Dynamics of Unprompted Thought in Creative and Ruminative Individuals

Although it is widely appreciated that spontaneous thought unfolds in a dynamic fashion, static methodologies have dominated our mainstream understanding of this important phenomenon. As a result, relatively little is known about the way thoughts arise and unfold over time, especially during idle periods when left to our own musings. In this talk, I will first motivate my interest in the flexibility and stability of unprompted thought in relation to the concept of mental exploration. Next I will describe behavioral paradigms that we have used to measure the content and dynamics of thought. I will then describe how these indices relate to flexible problem solving (i.e. creativity) and traits relevant for mental health (i.e. trait rumination). Finally, I will conclude by bridging these findings to the neuroscience literature, and speculate on their relevance to society at large.

Herbert Terrace

In the Beginning There Were No Words

The literature on the evolution of language has focused mainly on the origins of grammar. Although grammar could not have evolved without words, the origin of words has received virtually no attention. I will describe the remarkable transition from animal communication to words and discuss their phylogenetic and ontogenetic origins. My focus will be on non-verbal emotional and cognitive relations between an infant and her mother during the infant's first year that are crucial for the initial production of words. Like grammar, those relations are uniquely human.

Lynne Reder

Re-thinking Working Memory: Familiarity may breed contempt, but it sure makes doing stuff easier!

Working Memory should be considered a limited resource that is consumed in the processing of information. The familiarity (or chunk strength) of the input and the rate of its presentation affects whether the task is easy or becomes unmanageable. Research that led to this hypothesis, as well as evidence that supports this theory, will be presented (hopefully not too fast to be processed).

Kara D. Federmeier

Connecting and considering: How the brain finds meaning in time

A lynchpin of human cognition is the ability to rapidly and effectively link incoming sensory information to knowledge stored in long-term memory. Work in my laboratory has revealed that in a relatively invariant time window, uncovered through studies using the N400 component of the event-related potential, incoming sensory information naturally induces a graded landscape of activation across semantic memory, creating what might be called "proto-concepts". This process of *connecting* affords the continuous infusion of meaning into human perception. Connecting can be -- but is not always -- followed by a process of further *considering* those activations through a set of more attentionally-demanding comprehension mechanisms. This kind of “active” comprehension entails selection, augmentation, and transformation of the initial semantic representations. The result is a limited set of more stable bindings that can be arranged in time or space, revised as needed, and brought to awareness. Collectively, these findings reveal the complex relations among sensory processing, attention, memory, and control systems that allow people to both rapidly and flexibly understand one another across the lifespan.

George Sperling

(with Peng Sun & Veronica Chu)

Multiple concurrent centroid judgments imply multiple within-group salience maps

Multiple concurrent centroid judgments imply multiple within-group salience maps Peng Sun1 & Veronica Chu1 & George Sperling1 Accepted: 30 October 2020 # The Psychonomic Society, Inc. 2021 Abstract Subjects viewed a brief flash of 8–24 dots of either two or three colors randomly arrayed. Their task was to move a mouse cursor to the centroid (center-of-gravity) of each color in a pre-designated order. Conventional and idea-detector analyses show that subjects accurately judged all three centroids utilizing an astounding 13/24 stimulus dots, with only a modest loss of accuracy compared to judging a single-predesignated color centroid. The ability to concurrently compute three centroids is important because it is believed that centroid judgments are made on salience maps that record only salience and are ignorant of the features that produced the salience. Our explanation, instantiated in a computational model of salience processing, is that subjects have three salience maps. Dots are initially segregated into three groups according to color, then each color-group is recorded on a different salience map to compute a centroid. In Part 2, the data are analyzed in terms of Attention Operating Characteristics to characterize impairments in subjects’ color-attention filters (mostly insignificant) and encoding efficiency (20% drop for the hardest task) in making multiple versus single centroid judgments. A new, more sensitive analysis measured five sources of subject error variance, four independent, additive sources of error variance: imperfect color-attention filters; a Bayesian-like bias towards a central tendency; storage, retrieval, and cursor misplacement error; a large residual error due mostly to inefficient encoding; and fifth, an interactive source – error in all four components that increases when multiple centroid judgments versus a single centroid judgment are required on each trial.

Richard Shiffrin

(with Ashley Maxcey, Rob Nosofsky, Rebecca Cutler, Dick Atkinson & Denis Cousineau)

Causes of forgetting

What are the chief causes of forgetting? Several causes are well established and accepted: For short-term memory, limited capacity. There are reasons to believe long-term memory does not suffer from a similar capacity limitation and memory traces remain more or less permanent if undisturbed. Nonetheless long-term forgetting occurs and accepted causes are competition (aka interference, cue overload); context change; memory changes caused by retrieval. Bob Bjork, Elizabeth Bjork and Michael Anderson highlighted another possible cause of long-term forgetting in a 1994 paper, namely inhibition causing a reduction in trace strength of a trace that is retrieved but is not the one desired. I discuss these various causes and a test of the inhibition hypothesis.

Robert Goldstone

A Computational Model of Context-Dependent Encodings During Category Learning

Although current exemplar models of category learning are flexible and can capture how different features are emphasized for different categories, they generally lack the flexibility to adapt to local changes in context, such as the effect of different sequences of study. Paulo Carvalho and I (2022, Cognitive Science) have developed a new model of category learning, the Sequential Attention Theory Model (SAT-M), in which the encoding of each presented item is influenced not only by its category assignment (global context) as in other exemplar models, but also by how its properties relate to the properties of temporally neighboring items (local context). SAT-M explains people's performance on different sequences of trials (e.g. interleaved vs. blocked categories) by assuming that people place emphasis on features shared by successive items belonging to the same category, as well as features that differ between successive items belonging to different categories. Comparatively, ALCOVE, SUSTAIN, and a version of SAT-M without locally adaptive encoding provided poor fits to the results. Moreover, we found empirical support for the model's prediction that different sequences of training change what learners look at and encode. The successes of SAT-M point to the benefits of paying attention to how attention is paid trial-by-trial during category learning.

James Townsend

(with Yanjun Liu & Michael J. Wenger)

Don't be a Square: The Processing Mechanisms Characterizing the Elemental Dimensions of Width and Height

What are the geometric and information processing characteristics of elementary figures which are composed of simple physical dimensions? There have been a number of investigations of perception of rectangles, including debate about configurality (e.g., integrality and gestalt properties) as well as the prime perceptual dimensions. Yet, because of ambiguity even in the 'right' definition of configurality and an absence of penetrating methodologies, there is still little known concerning the information processing of these patterns. To this end, the present study brings together two separate theory-driven methodologies, general recognition theory (GRT) and systems factorial technology (SFT). The first attacks the problem of dimensional interactions while the latter seeks to uncover process characteristics such as architecture, decisional stopping rules, and workload capacity. The same observers and as much as possible, the same stimuli, were used in both approaches. Through our GRT analyses, we found strong evidence for dependencies between the percepts of height and width on both within-stimulus and cross-stimulus bases. Height perception was better with narrow widths and width perception was superior with short heights. In addition, a significant positive within-trial

correlation of dimensions was evidenced within squares but not with rectangles. Our SFT initiative uncovered consistent signatures of parallelism paired with super capacity, the latter appearing both through the traditional conditioning on being correct and still present when modest speed accuracy trade-off was accounted for. Thus, the SFT and GRT inferences were quite compatible with a plausible cause of the positive correlations being across-channel facilitatory interactions which led to super capacity processing.

Marisa Carrassco

How Attention shapes Perception

I will discuss how endogenous (voluntary) and exogenous (involuntary) attention differentially alter performance, featural representations and cortical activity. I will present converging evidence from psychophysics (performance and reverse correlation), neuroimaging (fMRI), neurostimulation (TMS) and computational modeling.

Lynn Nadel

What Makes An Utterance Believable

My Abstract: Judging the credibility of stories we hear is critical. The studies I will present investigate the role of story details in influencing believability.

Steven Piantadosi

A unified model of number perception

I'll present evidence against "two systems" accounts of numerical cognition in which large and small numbers draw on distinct representational resources. Instead, I'll use an ideal-observer model to show that people's behavior is predicted by one system with bounded information processing capacity. Second, I'll present eye-tracking data which shows that people's number perception relies on serial accumulation of information across saccades, rather than rapid parallel processing common in number models. These two results closely link number psychophysics to visual memory systems.

Randy Engle

Measuring Attention Control: And Using those Measures to Select for Navy Jobs

I will discuss our efforts to better define and measure one’s ability to control attention. We have developed a variety of tasks, some old and some new, which are reliable and valid for predicting performance on a variety of real-world tasks. The current project has shown that a battery of these tasks adds incremental validity (they improve prediction) to real air-traffic control and pilot selection. This will save the Navy many millions of dollars each year.