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Fourteenth Annual Summer Interdisciplinary Conference

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Bouldering at Way Lake, Mammoth Lakes

Westin Monache Resort
Mammoth Lakes, California
July 10, Friday – July 15, Wednesday

Announcing ASIC 2015

The Fourteenth Annual Summer Interdisciplinary Conference (ASIC 2015) will be held at the Westin Monache Resort in Mammoth Lakes California. The dates are chosen to make it possible for attendees to travel on July 16 to Southern California first for the Mathematical Psychology Meetings to be held July 17-20 at the Hyatt Regency in Newport Beach (workshops/tutorials on the 17th), a special "industry meets mathematical psychology" conference on July 21, and then to the Cognitive Science Society Annual Meetings to be held in Pasadena July 22-25 (workshops on the 22nd). The Westin is an excellent four-star hotel-- www.westinmammoth.com (see Lodging on this site).

The Mammoth Lakes/Yosemite airport is 10 minutes from Mammoth Lakes, and flights change on occasion. Presently there is one flight a day to and from Los Angeles airport on Alaska Airlines: one from LA at 4 PM (arr. 5:16) and a return from Mammoth at 5:45 PM (arr. 7). Driving time from Los Angeles airport is about five hours.

Mammoth Lakes is at about 8000 feet in elevation on the eastern slopes of the Sierra Nevada mountains providing pleasant summer temperatures and outstanding scenery and choices of outdoor activities. It also provides the best and easiest summer access to Yosemite National park (see Activities on this site).

Richard M. Shiffrin of Indiana University - Bloomington is the organizer: Email correspondence should be directed to University or mailed to Richard M. Shiffrin at Indiana University -- select 'Contact' from the menu for the address. The organizer is shown below atop Castleton Tower at ASIC 2014.

The subject matter of the ASIC conferences is interdisciplinary, within the broad frame of Cognitive Science. ASIC uses the very successful format of previous ASIC and AIC

conferences: Days are free for leisure activities and discussions among participants. The talks are in the later afternoon/early evening, followed by dinner. The date has been chosen to make it convenient for attendees to bring family/friends. The conference is open to all interested parties, and an invitation is NOT needed to attend. However, due to the small number of spots for speakers, the organizer will select the attendees to give talks, and choose the lengths of talks.

Previous Years' Websites

Several parts of this year's website are still under construction. For examples of previous years' websites visit ASIC 2014, ASIC 2013, ASIC 2012, ASIC 2011, ASIC 2010, ASIC 2009, ASIC 2008, ASIC 2007, ASIC 2006 and ASIC 2005.

Invitation

The conference is open to all scholars who fit the very general theme of the conference, and their family and friends. An individual invitation is NOT needed. We encourage you to send the conference information to friends and colleagues.

Conference Aims

The conference will cover a wide range of subjects in cognitive science, including:

- **modeling of cognition**
- **neuroscience, cognitive neuroscience**
- **psychology (including perception, psychophysics, attention, information processing, memory and cognition)**
- **computer science and artificial intelligence**
- **machine intelligence and learning**
- **methodology and statistics**
- **linguistics, psycholinguistics and computational linguistics**
- **philosophy of mind, cognitive science**

We especially invite talks emphasizing theory, mathematical modeling, and computational modeling (including neural networks and artificial intelligence). Nonetheless, we require talks that are comprehensible and interesting to a wide scientific audience. Speakers will provide overviews of current research areas, as well as of their own recent progress.

Conference Format

There is a single speaking session each day, intentionally organized to maximize the dissimilarity of each day's presentations. If the number of participants exceeds the number of speaking slots (about 42), then the organizer will select some talks to be of shorter duration, and if necessary choose the speakers that will have the opportunity to present their work. Information on submitting proposals for presentation is on the page of this website labeled "Talk Submissions". Please submit talk information on the website, even if you have already sent (some of) this information to the organizer.

The conference will start with registration and a reception with wine beer, drinks and food from 15:30-16:15 on Friday, July 10. On subsequent days there will be drinks and light snacks from ~16:00 - 16:15, followed by a session of about seven spoken presentations that include a mid-session drink break. The last evening of talks will be Wednesday July 15, so plan to depart no earlier than Thursday, July 16.

It will not escape the careful reader that this conference format frees most of the day for either discussions with colleagues or various other activities with colleagues, family, and friends. We expect all scientific attendees and participants to attend all sessions. The time frame will allow day trips to nearby sites, but arrange to return in time for the sessions. Travel to sites and planned activities from which a return for the session will not be possible by 16:00 should be arranged for days preceding or following the conference.

Registration

You are not officially on the request list for presenting research until you register and send the registration fee. Visit the Registration page at this website.

Lodging

A block of 'standard' rooms are presently being held, but are limited (at the price negotiated), and unreserved rooms will gradually be returned to the general public, so reserve soon. For information visit the Lodging page at this website.

Some possibly useful websites:

Coming soon...

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Registration Information for ASIC 2015

If you are planning to attend ASIC 2015, please fill out the registration form (which is not yet available, but check back soon) and submit your registration fee. This fee pays for rental of the conference room, equipment rentals, snacks and drinks at conference breaks, the group rock climbing day or days, and the opening reception.

This year's registration fee schedule, in US dollars is:

	Professional Attendees	Guests, 10 years and older
Prior to January 1, 2015	$250	$50
January 1, 2015 - March 1, 2015	$300	$75
After March. 1, 2015	$350	$100

Registration and payments are made via the Indiana University Conference Bureau as indicated on the registration form.

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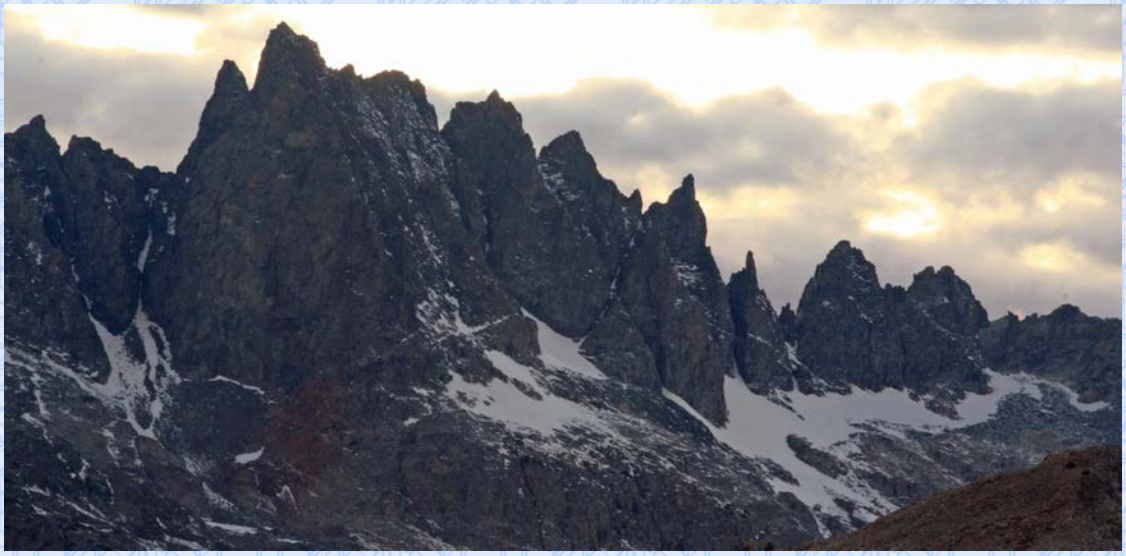

Submissions of Talks and Posters

Whether or not you have already sent some of this information to the organizer by email, please provide on the link below a list of authors (with the presenter indicated), their affiliations, and emails; a title, and an abstract (limit 250 words). These may be changed later, so do not hesitate to send them as early as possible. The organizer will use these to plan the conference and organize the sessions. Please go to the submission form (available soon.) Regular talks are limited to 30 minutes, a time that includes interruptions for questions, and final discussion. It would be best to plan for twenty minutes of actual speaking. The talks should be aimed not at specialists, but at a general scientific audience.

There is room on the program for about 42 30-minute talks. If there are more than 42 attendees wanting to present research, then the organizer will either choose some talks to be of shorter duration, or in extremity, decide which attendees will give presentations. Thus when registering and filling out the submission form, please indicate if you might be willing to 1) give a shorter talk; 2) forego giving a talk.

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Travel To and About Mammoth Lakes, California

It is probably worth exploring the area of Mammoth Lakes with Google Maps, and Google Earth.

HOW TO REACH MAMMOTH LAKES

One source of information is the Mammoth Lakes website:

http://www.visitmammoth.com

Under the 'About Mammoth Lakes' link there are driving directions from Reno, San Francisco, Southern California and Los Angeles. There is also information about the Mammoth Yosemite Airport which is onliy about six miles from town. This airport has limited but regular service for those who prefer not to drive from a major city airport elsewhere.

Another source of travel information is the Westin Monache Resort website, which has a zoomable map: http://www.westinmammoth.com/local-area

The annual meetings of the Society for Mathematical Psychology will be held in Southern California immediately following ASIC, and those meetings will be immediately followed by the annual meetings of the Cognitive Science Society in Pasedena California. ASIC attendees planning to attend either or both of these might find it most convenient to use the airport in Los Angeles either as a destination or a place from which to fly to Mammoth Yosemite Airport.

Those driving to ASIC from Southern California should note the possibility of stopping en route at Death Valley. When at Mammoth Lakes there is relatively easy driving access to Yosemite National Park.

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Lodging

We have placed a hold on rooms sufficient for our conference needs at the Westin Monache Resort in Mammoth Lakes, California. This is a four star hotel with many services and facilities. See 'Travel' for directions and ways to reach the area and the hotel. The hotel website is at: http://www.westinmammoth.com.

LODGING and DINING RATES:

We recommend a package for room, breakfast and dinner. Attendees can choose a lodging package only, but the complete package is the preferred choice: Dining together as a group

is an important component of the conference, fostering interdisciplinary collaboration and information gain.

Lodging reservations should be made early, starting in the fall of 2014.

Reservations must be made with a password that will be provided by the organizer upon request: email *These reservations require no deposit or payment until one week prior to ASIC.* **Full payments need to be made at or before that date: Such payments can be refunded until one week prior to ASIC but then are non-refundable. Because there is no cost to reserving, please do so as soon as possible if there is a reasonable chance you might attend.**

RATES:

Breakfast and dinner will add $60/day/person:

Deluxe suite with view: $139:

Room with King Bed, and Double pull out sofa bed

One bedroom suite: $169:

Bedroom with King Bed and living room with Queen pull out sofa bed; a rollaway can be added, upon availability

Two bedroom suite: $289

One bedroom with King, one with Queen, and living room with a Queen pull out sofa bed; rollaway can be added, upon availability

These room rates are subject to taxes and fees currently at 14.75% but could change slightly. The description of the room types are given on the hotel website but additional questions can be answered by calling the hotel.

Hotel Features:

Parking (valet or self parking) is available at the hotel as part of the package, as is internet access, local and long distance calls in the US, in town shuttle service, and airport transfers from the nearby Mammoth Yosemite airport. The hotel has a 24 fitness facility, an outdoor heated pool and hot tubs, and a business center. Fees would apply fort the kids club (12 and under), nearby spas, and nearby gold courses.

Reservations:

To reserve, please call Micaela Castronova (or her representative) at: using a code that the organizer will provide to professional attendees who send an email request to (

Telephone Reservations: Micaela Castronova at **(use code to reserve).**

Westin Monache Resort

50 Hillside Drive, • Po Box 388 • Mammoth Lakes, CA 93546.

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Food/Dining

Mammoth Lakes is replete with many restaurants, but given the lateness of the conference talks, the availability of the hotel restaurant, and the many factors favoring a group dining experience, we recommend taking advantage of the package rates including breakfast and dinner. We are planning to have buffet style meals with a variety of choices including vegetarian options and entrees. The registration fee will pay for the food and drink at the opening reception, and at the session breaks. Alcoholic drinks will be charged to the individual attendees.

Breakfasts will begin at ??? and end at ???. Each day after the opening day the conference

will begin with light snacks and liquid refreshments at about 3:45-4:15, followed by talks, and a 15 minute break with more drinks about midway through the session (about 6:00). The first day of the conference (Friday, July 10) will have a reception starting at 3:15 at which we will provide name tags, information, schedules and have a variety of snacks and drinks. Dinner will follow directly after the sessions, approximately at 8:15.

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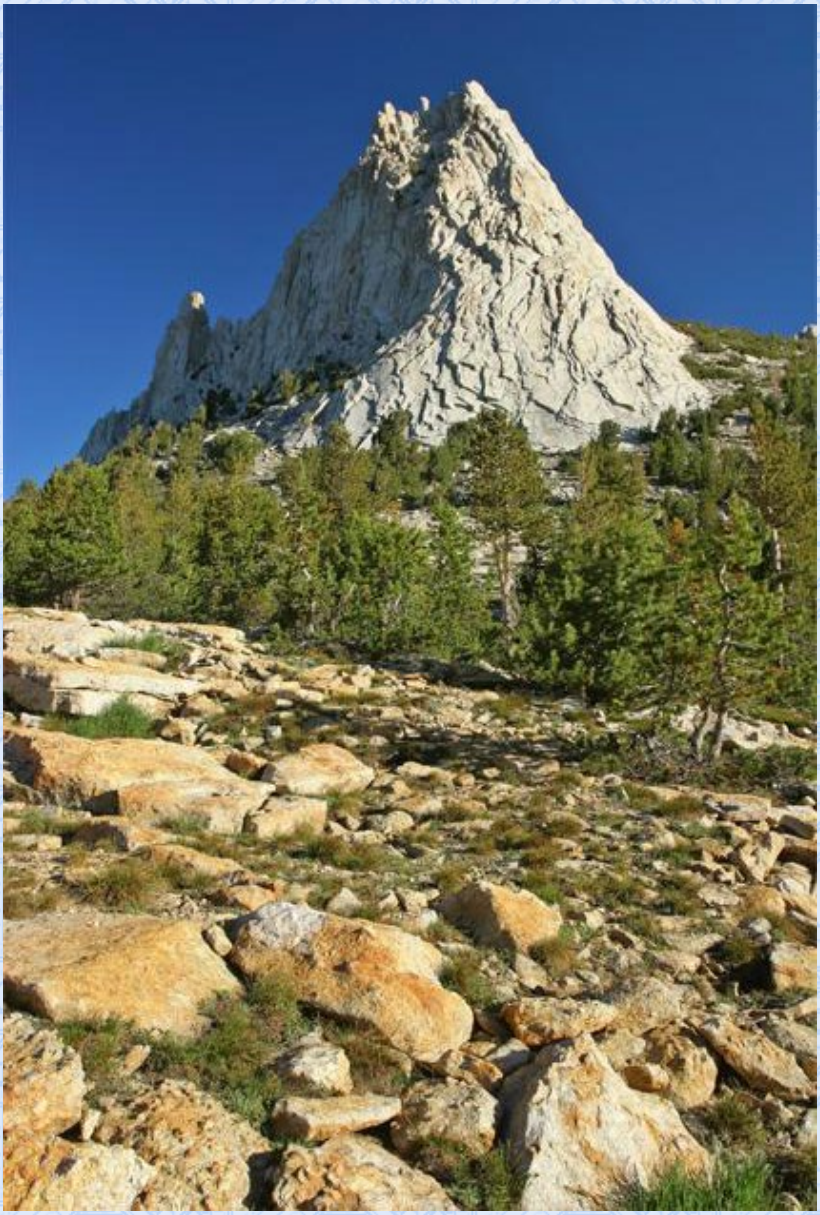


Cathedral Peak, Tuolumne Meadows

Activities in and about Mammoth Lakes

A large variety of outdoor activities can be found in the immediate area of Mammoth Lakes, in the upper elevation portion of Yosemite National Park just to the west of Mammoth Lakes (Tuolumne Meadows) and in the eastern slopes of the Sierra Nevada mountains just to the south of Mammoth Lakes. These activities include walking, hiking, scrambling, mountaineering, rock climbing, mountain biking, road biking, fishing, kayaking, golfing and much more. Over the next few months this web page will be filled out with descriptions of the many possibilities. At the present time this site describes only the climbing options, but the photos give a good idea of the terrain and the scenery that will be

found in drives, walks, and hikes.

Rock Climbing is one of the many activities available in the general area of Mammoth Lakes, Yosemite, and the eastern slopes of the Sierras south of Mammoth Lakes. Rock climbing has always been a featured activity at the ASIC conferences (e.g. the picture above shows the organizer on pitch three of a climb of Castleton Tower during ASIC 2014, in Moab Utah).

As has been the case for almost every ASIC conference we will again be lucky to have the services of Guido Bonvicini, for climbing and other outdoor activities (from ASIC 2014, the picture on the left below shows the tower Ancient Arts, and the picture on the right shows Guido atop the final corkscrew--beginners, novices, and others are not required to produce similar photos).

CLIMBING

Mammoth Lakes area:

One of the area activities will be a group rock climbing day (or perhaps two), free to all who register and wish to come, whose aim is to introduce beginners and novices to outdoor rock climbing in a scenic venue.

There are a large number of rock climbing areas adjacent to or quite near Mammoth Lakes. For those interested a guide to the local climbing is Mammoth Area Rock Climbs, 3rd Edition, by Marty Lewis--the plentitude of climbs is indicated by the 300 pages in this guide.

A few photos illustrate some of the possibilities. An easy multipitch climb (many pitches) is Crystal Peak:

Crystal Peak, Mammoth Lakes

There are also a variety of walls, including Dike Wall:

Dike Wall, Mammoth Lakes

There are plentiful bouldering opportunities, as illustrated in the photo at the top of the home page, and also here:

Bouldering in Way Lake area, Mammoth Lakes

Yosemite National Park, and Tuolumne Meadows:

Yosemite Valley, iconically famous, is extremely crowded in mid-summer (access by vehicle is tortuously slow) and, because it lies at relatively low altitude, is very hot at that time. However the high altitude portion of Yosemite, Tuolumne Meadows, has good summer temperatures, is wonderful for hiking, photography, and rock climbing, and is easily reached from Mammoth Lakes. It has one main road (Route 120) from Tioga Pass on the east (the entrance at about 10,000 foot elevation that one accesses from Mammoth Lakes) to Olmstead Point on the west, at which point the road descends via a roundabout switchback loop to Yosemite Valley Floor.

It is worth noting that a visit to the valley floor from Mammoth Lakes is possible during the conference days, but the time this takes will limit activities in the valley. By car it is about 45 minutes from Mammoth Lakes to Tioga Pass and the east entrance to the park. It is then another 1.5 hours to the west entrance to Yosemite, at which point one joins the usual summer traffic jam trying to gain entrance to the valley floor. If one supposes three hours each way and a return by 4 PM for the talks, then even with an early start there would be only perhaps three hours in the valley itself. However, views of the valley are available from the meadows: There are quite good and dramatic views of Half Dome and some of Yosemite valley a short walk from Olmstead Point at the west end of Tuolumne Meadows. Of course visits to the valley floor before and after ASIC are quite possible.

Tuolumne Meadows is an alpine meadow, so the road is relatively flat with views of flowers, wildlife, wandering streams and lakes, and many granite domes. If one is willing to hike there are many quite dramatic and scenic views available, as illustrated with some of the photos here, showing some of the sites and possibilities for hiking and rock climbing.

Most ASIC attendees will have cars, but there are various bus tours form the Mammoth Area, and from Tuolumne Meadows to the valley floor, and a free shuttle service across Tuolumne Meadows (see http://www.nps.gov/yose/planyourvisit/tmbus.htm).

Some of the longer hikes and climbs in Tuolumne would require such a long time that it

would not be possible to return in time for the conference presentations--for these it would be best to plan itineraries for days prior to or after ASIC. However there are many shorter hikes and climbs quite close to the road (including multi-pitch climbs of easy or moderate difficulty) that could be planned for conference days.

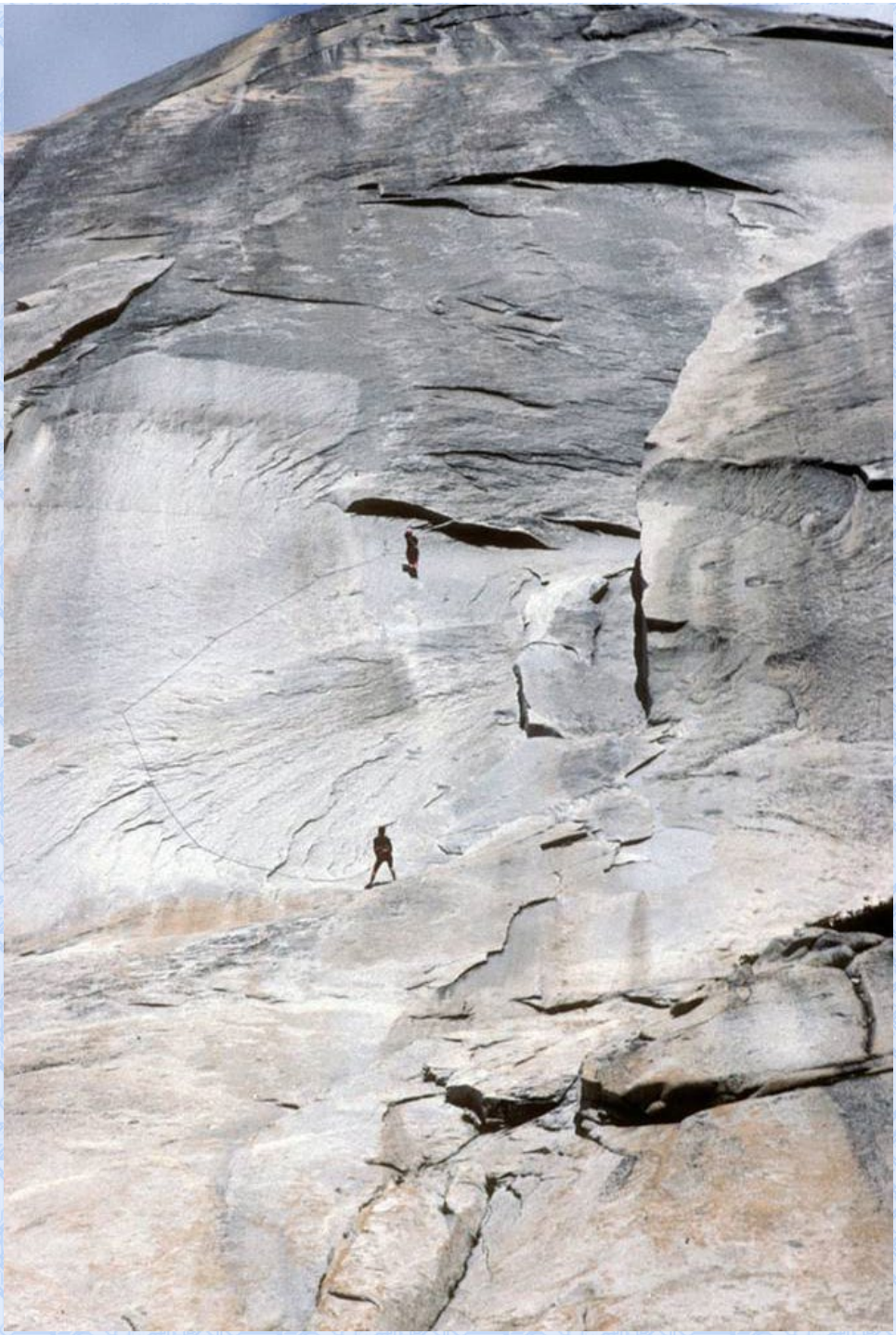
The possibilities for rock climbing in Tuolumne Meadows are endless, because of the profusion of granite domes. A book describing many of the main possibilities is *Tuolumne Free Climbs, 2nd Edition*, by Barnes, McNamara, Roper. Many of the climbs are easy or intermediate in difficulty and involve many pitches (though not as many as found on the large cliffs in the valley). Some of the climbs require long approaches from the road and are best planned for days prior to or after ASIC. However, many of the granite domes and the climbs on them are adjacent to the road, or just a short walk distant, and climbs and hikes on them would be quite feasible on conference days.

The Great White Book, Tuolumne Meadows

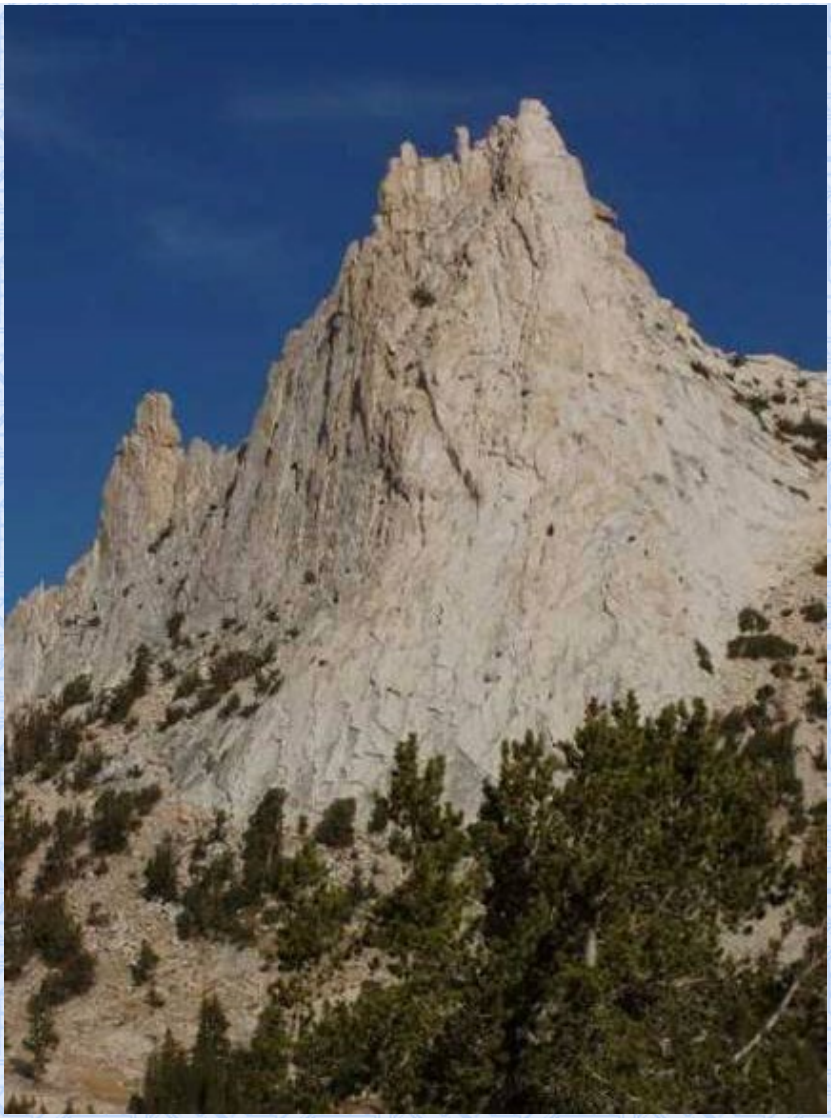
Climbing the Great White Book, Tuolumne Meadows

Eichorn's Pinnacle, Tuolumne Meadows

Fairview Done, Tuolumne Meadows

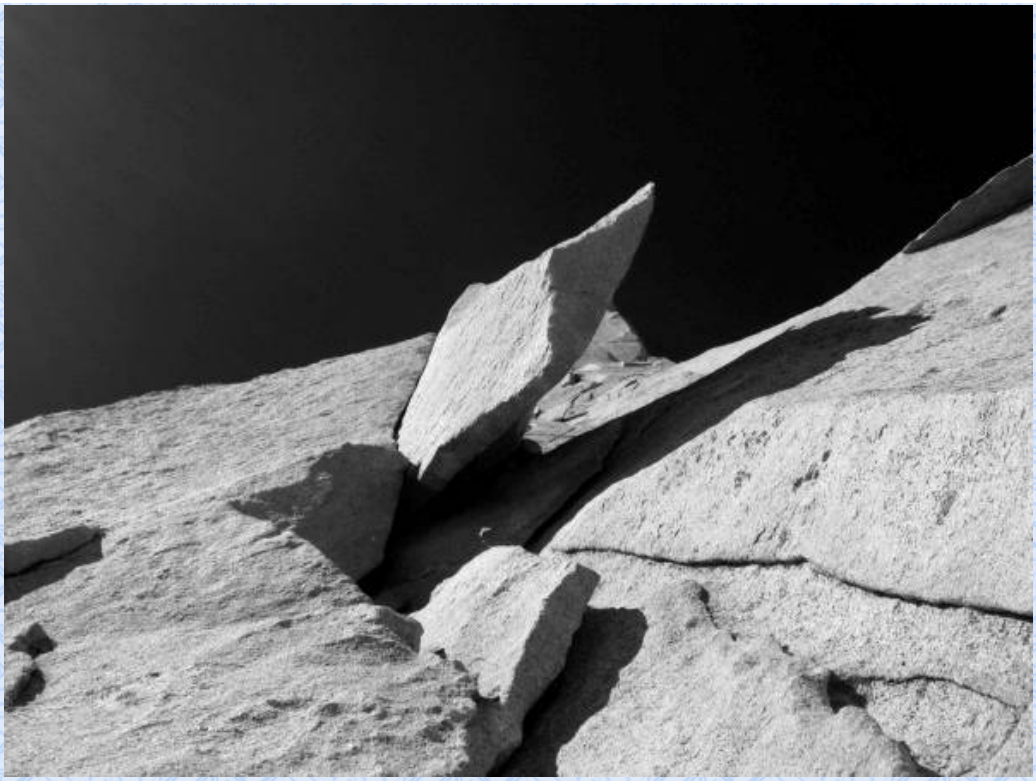


Climbing Fairview Dome,Tuolumne Meadows

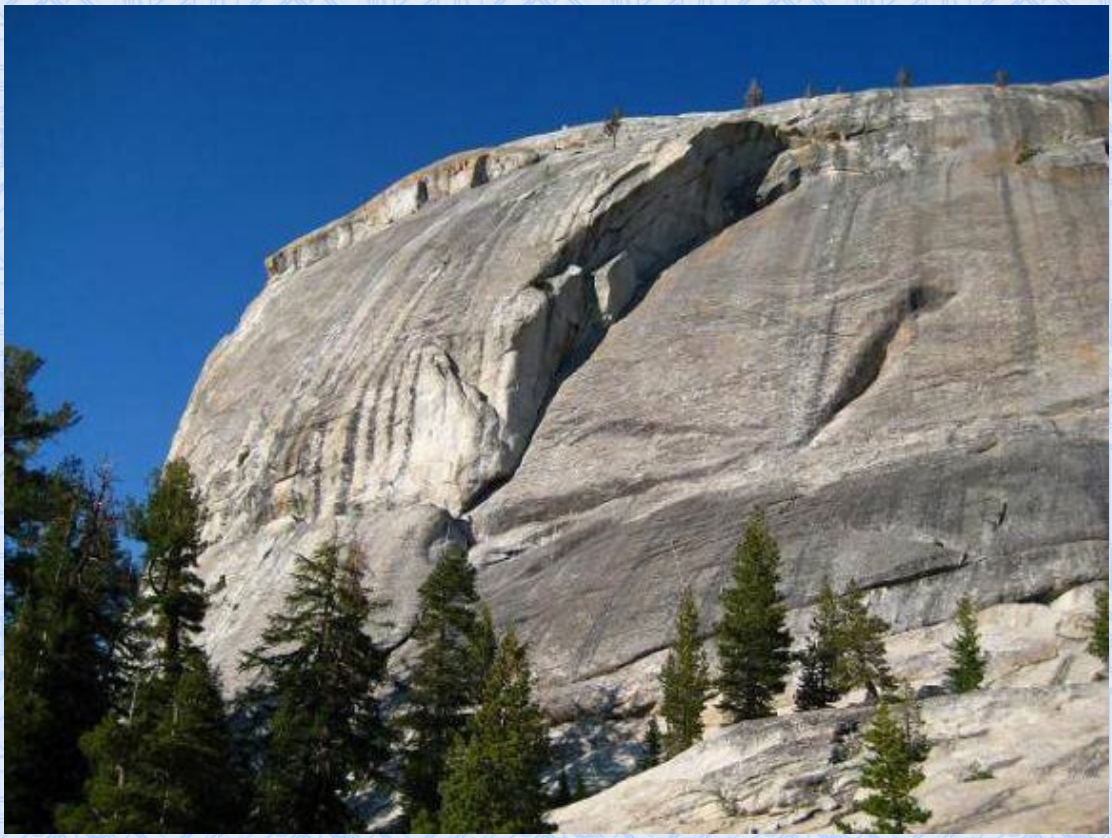


Cathedral Peak, Tuolumne Meadows

Third Pillar of Dana, East of Tuolumne Meadows



Near top of Third Pillar of Dana, east of Tuolumne Meadows



Crescent Arch, Daff Dome, Tuolumne Meadows

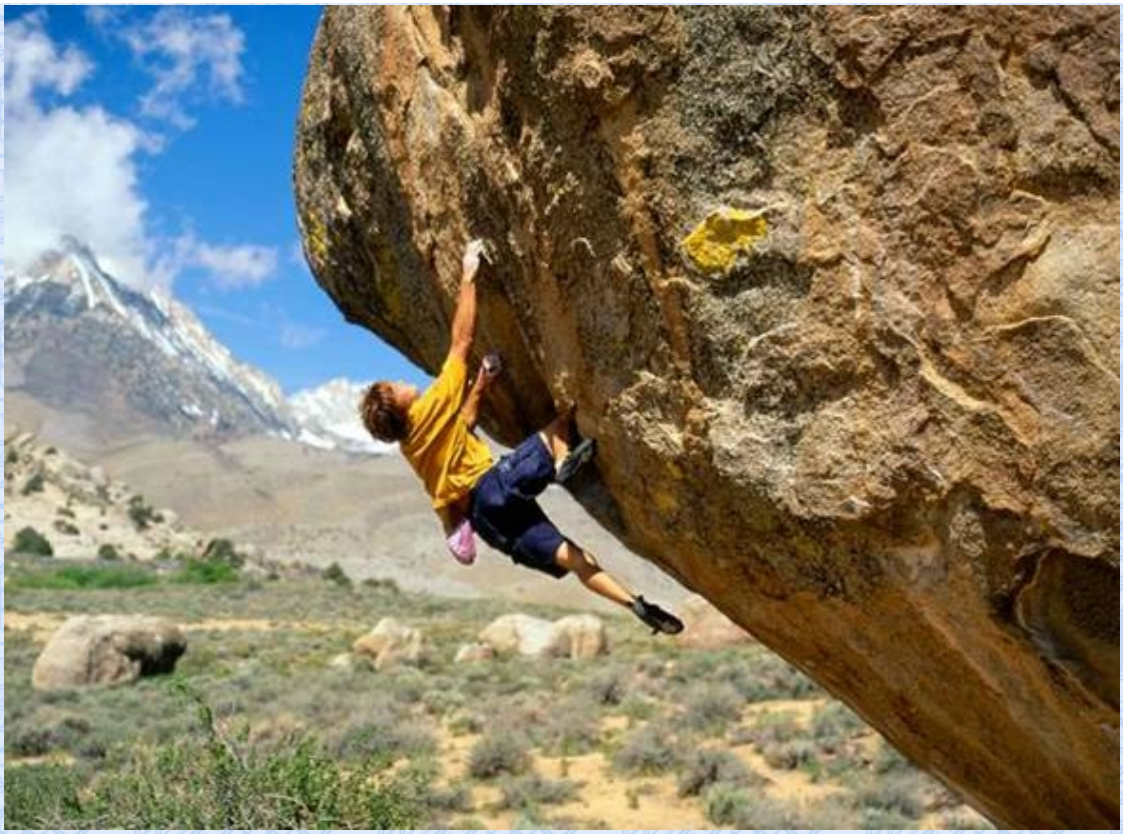
Climbing South of Mammoth Lakes:

South of Mammoth Lakes is a large area on the eastern slopes of the Sierras, extending from the Owens River Gorge (25 minutes drive south), Bishop area (43 minutes drive south) to Lone Pine (90 minutes south, and just east of Mt. Whitney). There are several visitor centers.

The Bishop center website is: http://www.bishopvisitor.com/activitiesBishopArea.php.

The general area near Bishop is most famous for bouldering (Happy Boulders, the Buttermilks and much more) but there are also a huge number of roped rock climbing areas. The guide to bouldering and rock climbing is: Bishop Area Rock Climbs by Croft and Lewis. This guidebook covers all the areas to the south other than Owens River Gorge.

Bishop Area Scenery



Bouldering in the Buttermilks, Bishop Area

Mt. Whitney from the Bishop Area

Guitar Lake, Mt Whitney Hiking, near Bishop

Owens River Gorge:

The Owens River Gorge (ORG) is about one hour driving southeast from Mammoth Lakes. The guidebook to the ORG is Owens River Gorge Climbs, 10th Edition by Lewis. The ORG has a huge number of one and two pitch climbs of high quality, most bolted for sport climbing. Summer temperatures in the ORG can be hot at times, so climbing there should be planned in line with the temperature forecasts, and/or in the early AM or in the shade.

HIKING

All of the areas described above in the climbing sections have extensive hiking available. It should be noted that altitude is very high in some areas: High altitude hiking requires acclimatization and time and difficulty are easy to underestimate. For example the Sierra's stretching from north of Mammoth Lakes and Yosemite down to Mt. Whitney (the highest point at 14,500 ft.) has numerous peaks above 12,000 feet. Many high peaks have non-technical routes to the top (trails, or scrambling at levels of class 1-2, perhaps a bit of 3, with routes marked only by cairns). A number of the highest peaks, especially those with long approaches best be reserved for days before or after ASIC (and a few with long approaches from the nearest trailhead would be much easier with overnight camping near the base). Descriptions of the way to get to the high peaks of Yosemite may be found at: http://www.summitpost.org/yosemite-s-highest-peaks/742800.

Only a few of the highest peaks are accessible as day trips during ASIC, given the need to return by 4 PM. Those high peaks that are accessible during ASIC would require a very early AM start, and fast, fit and acclimatized hikers. An example would be Mt. Dana, a peak that is highly recommended (for hiking, as well as for the climbing on its Third Pillar of Dana). The easiest routes to the summit are the NW Slope (or West Slope) and the Glacier Canyon (both Class 2). These routes starts at the Tioga Pass entrance station to Yosemite on Rt.120, at 9,941 ft. (~ ca. 3000 m), and present a strenuous half-day hike to the summit at 13,053 ft. E.g. the NW slope route from trailhead to summit is only 2.8 miles but climbs about 3,100 vertical feet at an *average* grade of about 23%. This hike is described on the above website, and also in: http://www.everytrail.com/guide/day-hike-to-mt-dana-.

Aside from the highest peaks in the Sierras, there are numerous hikes of high quality giving excellent views that can easily be done during ASIC in time for a return by 4 PM. These include a few of the lower peaks, such as some of the domes in Tuolumne Meadows, and hikes below the peaks but giving outstanding views, often along the sides of the many lakes in the area.

Particularly noteworthy for those wanting views of Yosemite Valley is the seven mile (each way) hike to Clouds Rest, from the western end of Tuolumne Meadows, starting at Tenaya Lake on Rt. 120 at altitude 8150 ft. ending at the peak at altitude 9926 ft. and providing one

of Yosemite's best views, including the valley and half dome. See: http://www.yosemitehikes.com/tioga-road/clouds-rest/trail-map.htm. See the photo below:

Many trails in the immediate Mammoth Lakes area are described in:

- **http://www.mammothtrails.org**
- **http://www.mammothtrails.org/trails/**
- **http://www.mammothtrails.org/activity/29/.**

A strenuous and scenic loop trail over Mammoth Crest is described at: http://www.hikingwalking.com/destinations/ca/ca_ses/mammoth_lakes/mammoth_crest.

A more comprehensive map of many possibilities in the general area is found on a scrollable and zoomable map at: http://www.trails.com/activity.aspx?area=14121.

Hikes in and around Yosemite are given at: http://www.yosemitehikes.com/hikes.htm.

A scrollable and zoomable map is found at: http://www.trails.com/activity.aspx?area=14366.

See also: http://www.summitpost.org/tioga-pass-area/711332.

Some attendees may wish to hike up Mt. Whitney, but the distance from Mammoth Lakes and the time to hike and return will not allow such a tour to be made during ASIC. However, such a hike could be planned for days before or after. See for example: http://www.nps.gov/seki/planyourvisit/whitney.htm.

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Schedule

There will be a single speaking session each day each with seven (or more) talks. These sessions will be held in a conference room at the Westin Monache Resort. Normal talk duration will be 30 minutes including questions and discussion. However, if there are more than 42 presenters, then some talks will be assigned shorter time limits. Information on submitting proposals for presentations is on the page of this website labeled "Talk and Poster Submissions".

The conference will start with registration and a reception at 3:30-4:15 on Friday, July 10. On subsequent days there will be drinks and light snacks from about 3:50 - 4:15, followed by a speaking session include a mid-session 15 minute drink break. Dinner will follow the session at about 8:15-8:30.

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Authors, Titles, Abstracts

Listing by speaker

Speaker	Averbeck, Bruno
Author 1	Averbeck, Bruno National Institutes of
Title	Markov decision processes as models for choice tasks
Abstract	Decision making has been studied with a wide array of tasks. In this talk I will examine and compare the theoretical structure of bandit, information sampling and foraging tasks. These tasks move beyond tasks where the choice in the current trial does not affect future expected rewards. We have modeled these using Markov decision processes (MDPs). MDPs provide a general framework for modeling tasks in which decisions affect the information on which future choices will be made. Under the assumption that agents are maximizing expected rewards, MDPs provide solutions which will maximize the number of rewards, on average. We find that all three classes of tasks pose choices among actions which trade-off immediate and future expected rewards. The tasks drive these trade-offs in unique ways, however. For bandit and information sampling

	tasks, increasing uncertainty or the relevant time horizon shifts value to choices that pay-off in the future. Correspondingly, decreasing uncertainty increases the relative value of choices that pay-off immediately. For foraging tasks the time-horizon plays the dominant role, as choices do not affect future uncertainty in these tasks. In addition to the modeling I will also examine behavioral performance on the same tasks. When examining behavior we will consider two questions. First, how close are subjects to the optimal models, and/or under what conditions are they more or less optimal? And, second, when subjects are suboptimal, how can the model be used to generate insight into the ways in which the subjects are not optimal.

Speaker	Cheng, Patricia
Author 1	Carroll, Christopher Carnegie Mellon University
Author 2	Cheng, Patricia UCLA
Title	Causal invariance and the construction of causal knowledge
Abstract	Causal knowledge consists of explanations of a reality that the learner has no access to except through representations. When do people feel dissatisfied with their explanation and revise their causal hypotheses? To develop causal explanations that generalize across the learning and application contexts, one criterion is to revise an explanation when the hypothesized cause is perceived to fail to operate the same way across different situations – that is, when the assumption of causal invariance is violated. Three approaches to causal learning – the associative approach, causal Bayes nets, and the causal-power approach – treat the violation of causal invariance differently. I present an analysis of three essential aspects of the criterion of causal invariance -- as an aspiration, a defeasible default assumption, and a description -- in shaping a generalizable representation of the causal world, and illustrate differences in the treatment of a violation of causal invariance involving binary variables by the three approaches. Whereas intuitive causal learning seems to adopt causal invariance as a criterion, this criterion is adopted by neither commonly used causal inference methods in machine learning nor associative inference models in psychology or in science. Our analysis suggests that the intuitive approach has adaptive value in light of the representational nature of causal knowledge.

Speaker	Cox, Gregory
Author 1	Cox, Gregory Syracuse University

Author 2	Shiffrin, Richard Indiana University
Author 3	Criss, Amy Syracuse University
Title	A Dynamic Approach to Item and Associative Recognition
Abstract	An approach to recognition that explicitly treats memory processes as dynamic has the potential to afford deeper insights into underlying mechanisms, such as those involved in criterion setting, speed-accuracy trade-off, and the nature of word frequency in episodic memory (Cox & Shiffrin, 2012; Cox & Shiffrin, in prep.). According to this approach, a recognition decision is based on a memory probe that evolves over time as features of the test item are perceived and/or retrieved from semantic memory. At any given time, the probe is compared in parallel to traces in episodic memory, which are activated to varying degrees depending on their similarity to the probe in both content (e.g., visual or semantic features) and context (e.g., time and location). The average similarity of the probe to traces in memory changes with characteristic dynamics that can distinguish between targets and foils, serving as a basis for recognition decisions. We extend this approach beyond single item recognition to the recognition of pairs and associations. Although the ability to discriminate between studied and unstudied associations has often been attributed to a recall-like process, we draw on evidence from a variety of previous studies of speed-accuracy trade-off and new studies measuring response time distributions to show that the dynamics of associative recognition are more consistent with a compound cue mechanism than with a form of recall. We present a formal model of this process that is a direct extension of the dynamic model for single-item recognition, with the key assumption that associations are represented as additional emergent features that do not join the probe until after most item features have already been accumulated. This model provides good quantitative fits to both response time distributions and speed-accuracy trade-off data in associative recognition and offers additional insight into the effects of pre-existing semantic associations among studied pairs (e.g, Dosher, 1984) and in the interpretation of ERP signatures traditionally attributed to familiarity and recollection processes (e.g., Rugg & Curran, 2007).

Speaker	Criss, Amy
Author 1	Criss, Amy Syracuse University
Author 2	Aue, William Purdue University

Title	(lack of) Output interference in retrieval from semantic memory
Abstract	The benefits of testing on later memory performance are well documented, however the manner in which testing harms memory performance is less well understood. This research is concerned with the finding that accuracy decreases over the course of testing, a phenomena termed output interference (OI). OI has primarily been investigated with episodic memory, but there is limited research investigating OI in measures of semantic memory (i.e., knowledge). We present data showing no OI in tasks that require retrieval from semantic memory.

Speaker	Foster, James
Author 1	Foster, James University of Colorado Boulder
Author 2	Jones, Matt University of Colorado Boulder
Title	Reliability Weighting for Relational Cue Combinations
Abstract	In previous talks, I have presented a computational model of Analogical Reinforcement Learning, in which analogy enables abstract generalization and reinforcement learning drives discovery of useful relational concepts. In this talk, I focus on an experiment with humans that supports two predictions of the model. The first prediction is that people should be able to associate reward values to categories that are defined by relational properties. This prediction applies even when no individual stimulus is ever repeated and no stimulus feature is predictive of reward. The second prediction is that people will learn how strongly to rely on different relational concepts depending on how predictive they are. The computational model learns which relational structures are more useful (i.e., more predictive of reward) and weights those structures more heavily when estimating the values of novel stimuli. In the experiment, participants were trained to select among stimuli to maximize their reward, with different relationally determined categories associated with different mean reward values. Reward variance was manipulated between categories, such that the schema defining one category was more predictive of the outcome than the schema defining the other category. Subjects learned to reliably choose stimuli from the category with the higher mean reward, indicating they could associate value with relational categories. Moreover, in generalizing reward prediction to compound stimuli (stimuli instantiating schemas from both categories), participants' reward predictions were biased toward the more predictive category. These results are consistent with both predictions of the model.

Speaker	Gibson, Steven

Author 1	Gibson, Steven Northcentral University
Title	Knowledge construction: A field neutral terminology for cognition
Abstract	How do we talk about cognitive products across differing fields of research? This report summarizes a proposed terminological approach for the discussion of cognition, learning and knowledge production. The fields of cognitive research, computer science, educational research, and management studies have differing models for cognition and differing theoretical approaches. A shared approach to discussing cognitive tasks and behaviors can open new areas of research and possibly answer some outstanding questions. This shared terminology should address representation of perceptual data, memory storage and recall, attention, concept relationship and knowledge construction. This terminology should be neutral as regards theoretical approaches employed in the fields of research and be free of embedded hypotheses regarding underlying mechanisms. This report focuses on terms relating to construction of knowledge and representation of information.

Speaker	Guest, Olivia
Author 1	Love, Bradley UCL
Author 2	Guest, Olivia Oxford
Author 3	Kopec, Lukasz UCL
Title	Optimism Bias in Novice and Expert Sport Forecasting
Abstract	People are optimistic about their prospects relative to others. However, existing studies can be difficult to interpret because outcomes are not zero-sum. For example, one person avoiding cancer does not necessitate that another person develops cancer. Ideally, optimism bias would be evaluated within a closed formal system to establish with certainty the extent of the bias and the associated environmental factors, such that optimism bias is demonstrated when a population is internally inconsistent. Accordingly, we asked NFL fans to predict how many games teams they liked and disliked would win in the 2015 season. Fans, like ESPN reporters assigned to cover a team, were overly optimistic about their team's prospects. The opposite pattern was found for teams that fans disliked. Optimism may flourish because year-to-year team results are marked by auto-correlation and regression to the group mean (i.e., good teams stay good, but bad teams improve).

Speaker	Hawkins, Robert
Author 1	Hawkins, Robert Stanford University
Author 2	Goodman, Noah Stanford University
Title	Why do you ask? Good questions provoke informative answers.
Abstract	What makes a question useful? What makes an answer appropriate? In this talk, we formulate a family of increasingly sophisticated probabilistic models of question-answer behavior within the Rational Speech Act framework. We compare these models based on three different pieces of evidence: first, we demonstrate how our answerer models capture a battery of four classic effects in psycholinguistics, which show that an answerer\'s level of informativeness varies with the inferred questioner goal. Second, we jointly test the questioner and answerer components of our model based on empirical evidence from a simple question-answer reasoning game. Third, we designed a real-time, multi-player version of this game with a wider range of conditions, which allows us to better distinguish among the questioner models. We find that sophisticated pragmatic reasoning is needed to account for some critical aspects of the data. People can use questions to provide cues to the answerer about their interest, and can select answers that are informative about inferred interests.

Speaker	Hemmer, Pernille
Author 1	Hemmer, Pernille Rutgers University
Author 2	Persaud, Kimele Rutgers University
Title	The Time Course of Errors in Long-Term Episodic Memory for Color
Abstract	Prior knowledge is known to influence recall when episodic information is noisy. Recent approaches, however, have suggested that recall is the result of either remembering (with some noise) or guessing (e.g. Brady et al. 2013). Importantly, the error distributions are well fit by a mixture of a Gaussian-like (noisy memory) and uniform (guessing) distribution. This stands in contrast to a Bayesian assumption that recall is a combination of expectations learned from the environment with noisy memory representations. Here, we evaluate the fidelity of long-term (LT) episodic memory for color, and the contribution of imprecise recall, prior knowledge, and random guessing to memory errors. Using a continuous recall paradigm, we found that at an aggregate level, performance appears to have a high rate of guessing. However, partitioning performance

	by lag (i.e., the number of intervening trials between study and test) reveals changes in the distribution of error over the time course of recall. We found that, immediate LT memory mirrors perception in its high fidelity, but with increasing lag the precision of memory appears to be more complex, and at longer lags recall is a mixture of episodic information, and guessing. We speculate that performance at intermediate lags, consistent with a Bayesian assumption, reflects the influence of category knowledge on noisy episodic representations. We implement and compare several models, including a simple Bayesian memory model and the 'remember-guess' model. Our findings suggest that, rather than the loss of fidelity in LT memory being acute, there is an intermediate stage reliant on prior knowledge.

Speaker	Hendrickson, Andrew
Author 1	Hendrickson, Andrew University of Adelaide
Author 2	Perfors, Amy University of Adelaide
Title	Zipfian distributions and cross-situational word learning
Abstract	How do children learn words when one word can refer to many possible referents in any given scene? One popular theory is that they can leverage the statistics of word usage across many different scenes in order to isolate specific word meanings (Yu & Smith, 2007). Both adults and children have shown impressive learning in this kind of cross-situational learning paradigm, but relatively little is still known about how well it scales to real language. Some have suggested that when words follow a Zipfian distribution (as they do in natural language), a full lexicon should not be learnable because of the many low-frequency words that are only observed a few times (Vogt 2012). In this work, we suggest the opposite: we show that when the distribution of words mimics that in natural speech -- i.e., when it is Zipfian -- adults show improved learning in cross-situational contexts. Over a series of experiments, we show further that this effect extends beyond the high-frequency words: when matched for word frequency, Zipfian distributions produce better learning than a uniform distribution. Implications for theories of word learning, cross-situational word learning, and second language acquisition will be discussed.

Speaker	Holden, John G.
Author 1	Amon, Mary Jean University of Cincinnati Psychology Department

Author 2	Holden, John G. University of Cincinnati Psychology Department
Title	Cause, Context, and Replication in the Social Science
Abstract	The presence of two exotic patterns of variability in response time measures, 1/f noise and distribution scaling, have important and unanticipated implications for the replication crisis in the social and behavioral sciences. The core issue that both Frequentist and Bayesian inferential statistics share an identical and necessary foundational assumption. They require that statistical samples originate from populations representing static and effectively fixed parameters. The only logically admissible uncertainty in a classical inferential test is population parameter variability resulting from either deterministic and stable “signals”—potentially indicating distinct populations—or from unsystematic sources of additive “noise” indicating a relatively tame ergodic form of probabilistic uncertainty. Systems that entail scaling behavior routinely express dramatic parametric fluctuations and even nonlinearities. How then does one distinguish fluctuations from the logical change assumed by inferential techniques? Obviously, the discipline must retain inferential techniques. Their outcomes, however, must be suitably contextualized. Two empirical studies are presented to illustrate the issues at hand.

Speaker	Jameson, Kimberly A.
Author 1	Jameson, Kimberly A. UC Irvine
Title	Interpersonal comparisons of color experience
Abstract	Color is an inner, highly subjective, experience, initially triggered by properties of light from the external world. Actual color perceptions depend on (i) visual processing properties of observers that can vary greatly across individuals, and (ii) minor changes in viewing circumstances. This talk presents empirical results on visual processing behaviors of four individuals. All four of these individuals have excellent color perception (as shown by standardized color vision assessment procedures). Two of the individuals are considered standard “normal” trichromat observers, while the other two are “potential tetrachromat” observers – that is, observers with a genetic potential for an extra class of visual pigments used for color vision. By comparing such observers\ \ \' color perception performance, and some of their behavioral uses of color, we illustrate how wide the definition of “normal” human color vision actually is, and how some observers that are typically classified as “normal” might actually experience a world of color beyond what the average color vision normal human experiences.

Speaker	jones, matt
Author 1	Jones, Matt university of Colorado
Author 2	Zhang, Jun University of Michigan
Title	Duality of similarity- and feature-based learning via kernel methods
Abstract	The kernel framework from machine learning offers a new perspective on psychological models of learning. In particular, recent work has shown that similarity-based generalization and feature-based association learning can be formally equivalent, provided the set of features bears the right relationship to the similarity function. Rather than treating this as an issue of model identifiability, we suggest viewing it as one of duality: The brain is doing similarity- and feature-based computation simultaneously. The kernel duality can be used to translate between these two modeling frameworks, using principles traditionally expressed in one to generate insights within the other. We illustrate this approach with the example of learned selective attention, showing how two very different theories of attention in learning -- grounded in similarity and in cue associability -- are complementary instantiations of the same general principle when cast within the kernel framework.

Speaker	Kalish, Michael
Author 1	Kalish, Michael syracuse university
Title	Talking about category learning
Abstract	Category learning remains essentially an enigma. Different people do different things under different conditions. The primary method for determining who does what, when, is to describe individuals\' response surfaces using a variety of models. These models are often identified as being indicative of particular strategies that participants might be using to learn the correct category labels for the stimuli. This is conceptually and methodologically problematic. Improved methodologies for estimating response surfaces may be helpful in understanding what people are doing. These methodologies may also illuminate essential limitations in the computational modeling of individuals\' category learning processes.

Speaker	Ketels, Shaw
Author 1	Ketels, Shaw University of Colorado, Boulder

Author 2	Healy, Alice University of Colorado, Boulder
Author 3	Jones, Matt University of Colorado, Boulder
Author 4	Sassnett-Martichuski, Diane University of Colorado, Boulder
Author 5	Lalchandani, Lakshmi University of Colorado, Boulder
Author 6	Guhl, Mary University of Colorado, Boulder
Title	Expertise reversal effects from variation in the use of classroom response systems.
Abstract	We manipulated the usage of classroom response systems, or "clickers," in four statistics classes, taught by the same instructor at the University of Colorado Boulder. In two experiments each conducted over the course of a single semester, we evaluated two common pedagogical prescriptions for clicker usage: (a) Clicker questions should be interleaved throughout the class period, and (b) clicker questions should be presented with protected time for discussion. In both experiments, conditions were alternated within-subjects, and these patterns of alternation were counterbalanced between the two classes. Performance on midterm and final exam questions was used as the dependent measure for both experiments. For all students, superior test performance was expected for material presented on days with clicker questions interleaved throughout the class and days when students were given extra time to discuss. However, we found expertise reversal effects in both experiments: Interleaving questions and peer discussion both affected students differentially depending on their knowledge of, and/or exposure to, class material.

Speaker	Kowler, Eileen
Author 1	Kowler, Eileen Department of Psychology, Rutgers University, Piscataway, NJ
Author 2	Santos, Elio Department of Biomedical Engineering, NJIT, Newark, NJ
Title	The importance of prediction and expectations in eye movement control
Abstract	The ability to make accurate predictions about the future states of

	the world is critical for motor control and perception, including the control of movements of the eye (smooth or saccadic). Even though eye movement systems can process and react to sensory signals quickly, accurate predictive responses are nevertheless crucial for overcoming the harmful effects of processing delays. A role for expectation and prediction in eye movements is shown vividly by anticipatory smooth eye movements, which are involuntary smooth pursuit eye movements in the direction of expected future target motion. Expectations about the future path of a moving target can be derived from various signals, including visual cues that signal the likely upcoming motion path, as well as memory for previously seen target motions (Kowler et al., 2014, Journal of Vision; Santos, 2014). The strength of the anticipatory response depends on the perceptual qualities of the cue, the validity of the cue, and memory for recently seen motions. These recent results suggest that anticipatory smooth eye movements depend on two factors: the strength of the belief about the direction of future motion, and internal estimates of the costs of pursuit error. The study of anticipatory smooth eye movements can provide a window into how the brain formulates and uses predictions, an ability that is surely used broadly for perception and motor functions, and is not limited to the control of eye movements.

Speaker	Landy, David
Author 1	Landy, David Indiana University
Author 2	Rogers, Brad Indiana University
Title	The probabilistic estimation of analogical relations
Abstract	When faced with uncertain situations and when direct evidence is hard to come by, people often invoke information from structurally related categories or situations. People often draw relational correspondences (i.e., analogies) across instances drawn from different domains. People make these analogies when they struggle for purchase in uncertain situations, but nearly all prior psychological studies draw relational correspondences across knowledge structures that are treated as deterministic and error-free. We aim to understand relational structure mapping in contexts in which structured knowledge has quantified uncertainty. Further, extant approaches to relational correspondence have primarily considered the quality of a complex analogy between two domains to be a function of its structural consistency, invoking factors such as 1-1 correspondence, and the number and depth of structural correspondences. We present a theoretical framework that instead articulates the detection of relational correspondences normative estimation of the probability that the models generating uncertain data in the two domains share a particular type of relational

	correspondence: that is, we embed analogical inference in a model-testing framework. More probable analogies result when an observed relational structure match was particularly unlikely to occur in the absence of a particular correspondence holding across the true domain models, relative to a specified set of baseline models. Taking together the traditional approach and the probabilistic approach yields two criteria for a good analogy: degree of structural correspondence and the probability of correspondence of unknown generating models. We will demonstrate that some previously identified features of high-quality analogies align with properties that provide evidence for an analogy's 'truth', but that in general the two approaches make dissociable predictions. We will consider the structure-match and probabilistic models in the context of a novel experiment in which subjects make explicit statements about the probability of an analogy.

Speaker	Lewandowsky, Stephan
Author 1	Lewandowsky, Stephan University of Bristol and University of Western Australia
Author 2	Ballard, Timothy University of Queensland and University of Bristol
Author 3	Risbey, James CSIRO Oceans and Atmosphere, Hobart, Tasmania
Author 4	Brown, Gordon University of Warwick
Title	Human Wishful Thinking vs. Scientific Uncertainty as Knowledge: Constraints on Climate Policy Choices Provided by an Ordinal Analysis of Uncertainty
Abstract	Uncertainty forms an integral part of science, and uncertainty is intrinsic to many global risks that dynamically unfold over time, from “peak oil” to genetically modified foods to climate change. Uncertainty is often cited in connection with political arguments against corrective action. Using climate change as a case study, we report an ordinal analysis (i.e., statements of the form “greater than”) of uncertainty within the climate system. This analysis is not sensitive to people's cultural cognition or subjective risk perceptions and reveals that greater uncertainty (i.e., “greater than expected”) provides greater impetus for mitigative action. This normative result stands in contrast to people's tendency to view uncertainty as a stimulus for “wishful thinking”, and hence a reduced impetus for mitigative action. We explore the reasons underlying people's wishful thinking and suggest that, paradoxically, they may also reflect a normatively optimal adaptation to features of the environment. We examine the interplay between human cognition,

	physical reality, and policy options in a simulation experiment involving sea level rise.

Speaker	Little, Daniel
Author 1	Little, Daniel The University of Melbourne
Author 2	Wang, Tony Brown University
Author 3	Nosofsky, Robert Indiana University
Title	Recency effects and response times in perceptual categorization: Comparing exemplar and rule-based accounts in a modified Garner task
Abstract	A large number of converging operations suggesting that, unlike separable dimensions, integral dimensions are processed holistically. This difference has been convincingly demonstrated by Garner's (1974) classic study which showed that integral dimensions, but not separable dimensions, tend to interfere with each other if one of the dimensions must be ignored but tend to facilitate one another if the dimensions are varied in a correlated manner. One key aspect of Garner's results is that item and response repetitions resulted in faster response times. Here we report an experiment in which we increased the number of stimuli to reduce stimulus repetitions. Nonetheless we find clear recency effects in both response time and accuracy. We test three models of category choice response times including both exemplar-based and General Recognition Theory models, but also a modern version the distance from boundary theory in which utilizes an integrated array of linear ballistic accumulators. Model comparison results and the theoretical implications of the recency effects will be discussed.

Speaker	Love, Bradley
Author 1	Love, Bradley UCL
Author 2	Kopec, Lukasz UCL
Title	When Limits in Attention are Really Limits in Memory Retrieval
Abstract	In learning and decision tasks, people often bias attention in seemingly suboptimal ways, such as overweighting the most diagnostic cue at the expense of integrating across all cues. For

	example, in predicting which of two teams should win a game, people might focus on the star players to the exclusion of other predictive factors. The common interpretation is that capacity constraints in people\'s attentional system lead to suboptimal weighting. An alternative explanation is that the attentional system is compensating for the noise induced by a limited and stochastic memory retrieval process. This view follows from the observation that, when making a decision, people stochastically and selectively retrieve a small set of relevant memories that provide evidence for competing options. This limited retrieval injects harmful noise into the decision process. Previous work demonstrates that idealizing training information (i.e., overemphasizing clear cut cases and de-emphasizing ambiguous cases) improves performance by reducing the harmful effects of limited memory retrieval. In the current work, we find that people shift attention to \"self-idealize\" in a manner that reflects the individual\'s capacity limits in memory retrieval. Given memory retrieval limits, we find that attentional weighting is near optimal. Purported deficits of attention may in cases reflect limits in memory retrieval.

Speaker	Matzke, Dora
Author 1	Matzke, Dora Univerity of
2	Love, Jonathon
Author 3	Heathcote, Andrew
Title	A Bayesian approach for estimating the probability of trigger failures in the stop-signal paradigm
Abstract	Response inhibition is frequently investigated using the stop-signal paradigm. In this paradigm, participants perform a two-choice response time task where the primary task is occasionally interrupted by a stop signal that instructs participants to withhold their response. Stop-signal performance can be formalized as a race between a go process that is initiated by the primary task stimulus and a stop process that is triggered by the stop signal. If the go process wins, the primary response is executed; if the stop process wins, the primary response is inhibited (Logan & Cowan, 1984). Successful response inhibition requires relatively fast stop responses as well as a high probability of triggering the stop process. Existing methods allow for the estimation of the latency of the stop response, but are unable to identify deficiencies in triggering the stop process. We introduce a Bayesian mixture model that addresses this limitation and enables researchers to simultaneously estimate the probability of trigger failures and the entire distribution of stopping latencies. We demonstrate that trigger failures play an important role in the stop-signal performance of healthy participants, and that

	ignoring them distorts estimates of stopping latencies. Moreover, we introduce BEESTS-WTF, a user-friendly software implementation of our trigger-failure framework. BEESTS-WTF comes with a graphical user interface and provides users with summary statistics of the posterior distribution of the parameters as well various diagnostics tools to assess the quality of the parameter estimates. The software is freely-available and runs on OS X and Windows operating systems.

Speaker	Mueller, Shane
Author 1	Mueller, Shane Michigan Technological University
Author 2	Thanasuan, Kejkaew Michigan Technological University
Title	Modeling the sources of fluent expert memory access and search in competitive crossword players
Abstract	Crossword play requires memory along two routes (semantic and orthographic) that provide complementary cues and constraints. The process can be understood as a memory search problem in which candidates are generated via memory retrieval, and then checked against the constraints to determine whether the candidate is satisfactory. It remains an open question whether this memory search can happen simultanously along both routes, or must happen for orthographic and semantic routes separately. We report the results of experimentation and a computational model that show the best explanation, for both novices and experts, is that memory search occurs with one type of cue at a time. This suggests that compound cues are typically not used to search memory in crossword play. Furthermore, these results, together with a computational model of crossword play, indicate that expert players may be especially adept at memory access via semantic (clue-answer) associations. This suggests an association-based account of knowledge expertise wherein recognitional decisions are constrained mainly be fluent memory retrieval rather than a more traditional decision process involving the ability to compare and weigh between options.

Speaker	Myung, Jay
Author 1	Myung, Jay Ohio State University
Title	A hierarchical Bayesian approach for optimized adaptive experiments
Abstract	Experimentation is at the core of research in the behavioral and neural sciences, yet observations can be expensive and time-consuming to acquire (e.g., MRI scans, responses from infant

	participants). A major interest of researchers is designing experiments that lead to maximal accumulation of information about the phenomenon under study with the fewest possible number of observations. In addressing this challenge, our lab has developed an adaptive design optimization (ADO) method. In this talk, I present its hierarchical Bayes extension, dubbed hierarchical ADO (HADO), that provides a judicious way to exploit two complementary schemes of inference (with group and individual data) to achieve even greater accuracy and efficiency in information gain. Also discussed are results from a validation study to evaluate the benefits and validity of HADO in both human and simulation experiments in the adaptive estimation of the contrast sensitivity function in visual psychophysics.

Speaker	Osth, Adam
Author 1	Osth, Adam University of Newcastle
Author 2	Dennis, Simon University of Newcastle
Title	Sources of Interference in Item and Associative Recognition Memory
Abstract	A powerful theoretical framework for exploring recognition memory is the global matching framework, in which a cue\'s memory strength reflects the similarity of the retrieval cues being matched against the contents of memory simultaneously. Contributions at retrieval can be categorized as matches and mismatches to the item and context cues, including the self match (match on item and context), item noise (match on context, mismatch on item), context noise (match on item, mismatch on context), and background noise (mismatch on item and context). We present a model that directly parameterizes the matches and mismatches to the item and context cues, which enables estimation of the magnitude of each interference contribution (item noise, context noise, and background noise). The model was fit within a hierarchical Bayesian framework to ten recognition memory datasets that employ manipulations of strength, list length, list strength, word frequency, study-test delay, and stimulus class in item and associative recognition. Estimates of the model parameters revealed at most a small contribution of item noise that varies by stimulus class, with virtually no item noise for single words and scenes. Despite the unpopularity of background noise in recognition memory models, background noise estimates dominated at retrieval across nearly all stimulus classes with the exception of high frequency words, which exhibited equivalent levels of context noise and background noise. These parameter estimates suggest that the majority of interference in recognition memory stems from experiences acquired prior to the learning episode.

Speaker	Pauli, Wolfgang (spin +1/2)
Author 1	Pauli, Wolfgang (spin +1/2) Caltech, Pasadena, USA
Author 2	O\'Reilly, Randall C. University of Colorado Boulder, CO, USA
Author 3	Yarkoni, Tal UT Austin, TX, USA
Author 4	Wager, Tor University of Colorado Boulder, CO, USA
Title	Regional specialization within the human striatum: novel insights from an unbiased data-driven approach.
Abstract	Decades of animal work and recent human neuroimaging analyses have identified distinct, but overlapping, striatal zones interconnected with different cortical and thalamic circuits. These zones are crucial for the organization of functional systems. Despite continuous efforts to subdivide the human striatum based on anatomy and resting-state connectivity, however, characterizing the different psychological processes related to each zone remains a work in progress. Here, we followed a data-driven approach, and analyzed large-scale co-activation data from nearly 6,000 human imaging studies. Following classical anatomical taxonomies, we (a) identify five distinct striatal zones with discrete patterns of co-activation with distal brain regions across many psychological conditions, and (b) characterize the different psychological processes associated with these zones. We find that the reported pattern of cortical activation in a study can be used to predict selective activation of striatal zones, and that activation in each functional zone is associated with distinct psychological processes. Some of these associations are well-established, such as the role of the ventral striatum in reward processing. Others are less established, such as a (1) selective involvement of the ventral striatum and adjacent anterior caudate in evaluating the value of rewards and actions, respectively, and (2) a specialization of the posterior caudate nucleus for executive functioning, often considered to be the exclusive domain of the prefrontal cortex. Our findings highlight the strong regional specialization within the human striatum for different psychological tasks and provide a unique view into underlying task demands.

Speaker	Pecher, Diane
Author 1	Pecher, Diane Erasmus University Rotterdam
Author 2	Roest, Sander

	Erasmus University Rotterdam
Author 3	Stötefalk, Nic Erasmus University Rotterdam
Author 4	Fiere, Alma Erasmus University Rotterdam
Author 5	Zeelenberg, René Erasmus University Rotterdam
Title	Action potentiation by object pictures
Abstract	Responses to pictures of graspable objects are influenced by the similarity between the response action itself and the actions that could be performed with the object. Thus, pictures of objects potentiate object-related actions. According to grounded cognition theories, action potentiation is the result of the sensory-motor simulations that constitute conceptual knowledge of objects. On this account, activation of a concept such as a hammer involves simulating actions such as a full hand grip with the hand that is closest to the handle. When the response involves the same hand or the same grip, responding is facilitated compared to a different hand or different grip because the response action is already activated by the object picture. Alternatively, the effect could be explained by task-specific stimulus-response compatibility. On this account, participants align dimensions of the stimulus and of the response, for example spatial location. When the dimensions are aligned, responses are faster than when they are not aligned, as in the Simon effect. In several paradigms, we found that spatial attention and the presence of response competition could explain performance. This suggests that stimulus-response competition is a more likely explanation than sensory-motor simulations.

Speaker	Pothos, Emmanuel
Author 1	Pothos, Emmanuel City University London
Author 2	Yearsley, James City University London
Author 3	White, Lee Swansea University
Title	Constructive influences in decision making: a quantum perspective
Abstract	It is well known that, in some cases, a judgment or choice can affect the underlying mental representations; that is, judgments or choices

	can have a constructive influence. Constructive influences can be fairly easily incorporated in standard cognitive models, for example, through assumptions that a judgment alters memory or attention for the related information. Interestingly, if one attempts to model (some aspects of) cognition using quantum theory, then certain judgments are required to be constructive. This is because so-called superposition states in quantum theory are such that a value for a corresponding observable does not exist prior to a measurement; rather, the measurement creates the observed value. In cognition, if certain opinion states are like superposition ones, then a judgment would likewise create the representations, consistent with the outcome of the judgment. Constructive influences in quantum models are thus a deep, structural feature of such models. Moreover, constructive influences have to be of a very specific kind. We present a simple experimental situation, whereby a second stimulus is always rated, but a previous, first stimulus is sometimes rated, sometimes not. A corresponding quantum model for how the first rating might impact on the second one is developed and its predictions confirmed across several experiments.

Speaker	Ratcliff, Roger
Author 1	Ratcliff, Roger The Ohio State University
Author 2	McKoon, Gail The Ohio State University
Title	Numeracy, Aging, and Individual Differences
Abstract	Thirty one elderly adults were tested on 5 numeracy tasks: a symbolic task (is this 2-digit number greater or less than 50), a non-symbolic task (is the number of asterisks in this array greater or less than 50), a go/no-go version of the non-symbolic task, a task used to control for brightness and area, and a number memory task. The diffusion model was fit to the data and model parameters were compared between the elderly adults and college-age adults. Individual differences in model parameters across the tasks (and IQ) were also compared.

Speaker	Shiffrin, Richard
Author 1	Shiffrin, Richard Indiana University
Author 2	Cao, Rui Indiana University
Title	Finding targets is faster than finding foils

Abstract	After study of a list of words, we test with target search: pick out the one list- word presented with three non-list-words, or test with foil search: pick out the one non-list-word presented with three list-words. Target and foil search are equally accurate but target search is much faster. The same is true when two choice words are presented. We suggest that target strengths are more strongly positively skewed than are foils, since only targets are studied and study sometimes produces large trace strengths. We modeled the effects with a race between four ballistic evidence accumulators. We discuss other (less plausible) models that can also predict these findings. The results and models should therefore be viewed as a guide for future research.

Speaker	Sikström, Sverker
Author 1	Sikström, Sverker Department of Psychology, Lund University, Sweden
Author 2	Kempe, Tomas Department of Psychology, Lund University, Sweden
Author 3	Söderlund, Göran Sogn og Fjordane University College
Title	Frequency Dependency in Stochastic Resonance
Abstract	The detection of a signal can be enhanced by the addition of noise in systems that are dependent on a threshold. This stochastic resonance phenomenon has previously been described to be fully dependent amplitude of the noise and the signal. We show theoretically that another factor, namely the signal's frequency, to a large extent modulates the likelihood of detecting the signal, and where detection is facilitated at low frequencies where more samples allows a better estimate of the noise. The theory was tested in an auditory signal detection task where low frequency (500 Hz) signals benefited more from noise than high frequency signals (4000Hz), providing support for the proposed theory. Furthermore a new and promising method for optimising the signal-to-noise ratio during the test session where evaluated. This method is unique compared to earlier studies in the sense that we kept the signal to noise ratio (SNR) between noise and stimuli constant during the conditions so that the noise volume parallel the stimuli volume during the sessions.

Speaker	Sperling, George
Author 1	Sperling, George University of California, Irvine
Author 2	Chubb, Charles

	University of California, Irvine
Author 3	Wright, Charles E. (Ted) University of California, Irvine
Author 4	Sun, Peng New York University, NY NY
Author 5	Inverso, Matthew University of California, Irvine
Author 6	Ton, Pauline University of California, Irvine
Title	Paradoxical anomalies in centroid SSRs
Abstract	A centroid judgment (clicking the center of gravity of a cloud of items) is a Statistical Summary Representation made following a briefly exposed visual display. Centroid judgments are useful in studying early processes of selective feature-attention. Subjects find the centroid of only a designated subset of items while ignoring the remainder, e.g., finding the centroid of items lighter than the background while ignoring items darker than the background. At ASIC-2014, I reported in great detail on subjects\' abilities to selectively attend to a requested color while ignoring other colors, and the perceptual attention filters for color derived therefrom. Time permitting, I will review three recent paradoxical anomalies. (1) Whereas subjects can accurately judge centroids of dark versus light dots, large versus small squares, squares versus triangles, and many other features, they cannot judge the centroid (nor the numerosity) of vertical bars among horizontal bars or vice versa. (2) Subjects can find the centroid of the more numerous dots, e.g., 12 dots of one color among 2 dots of each of 7 other colors, and vice versa, without any prior knowledge of the dot colors which vary on each trial. (3) In some cases, subjects are more efficient and more accurate in finding the centroid of items defined by a conjunction of features than in finding centroids of items defined by a unique feature. This is very different from results in visual search. Together, these results suggest that the processes involved in centroid judgments--and other SSRs--are different from previously-studied attentional processes.

Speaker	Starns, Jeffrey
Author 1	Starns, Jeffrey UMass Amherst
Author 2	Staub, Adrian UMass Amherst
Author 3	Chen, Tina UMass Amherst

Title	Implications of response time and eye movement data for models of forced choice recognition
Abstract	In a forced-choice recognition task, participants are asked to select which of two words appeared on an earlier list. Researchers have claimed that forced-choice tests can be used to discriminate signal detection models that make different assumptions about the nature of memory retrieval, and forced-choice recognition has also played a role in constraining process models of memory. Throughout the forced choice literature, models assume that participants compare the memory strength of the two items and select the one with stronger memory evidence. We evaluated response time (RT) and eye movement data in two forced-choice recognition experiments. Results suggest that participants base decisions on the absolute memory evidence for each alternative, and they only resort to evaluating the relative evidence when they are uncertain of the correct response. I will discuss how these results constrain potential sequential sampling models for forced-choice accuracy and RT data.

Speaker	Stephens, Rachel
Author 1	Stephens, Rachel Syracuse University
Author 2	Dunn, John University of Adelaide
Author 3	Hayes, Brett University of New South Wales
Author 4	Kalish, Michael Syracuse University
Title	The influence of logic training and believability on inductive and deductive judgments
Abstract	Dual-process accounts posit that separate heuristic and analytic processes contribute to reasoning. Under this view, inductive judgments are more heavily influenced by the quick heuristic processes that use background knowledge or associative information. In contrast, deductive judgments are more strongly influenced by the slower analytic processes that are more deliberate and rule-based. However, our recent meta-analysis of existing research showed there is limited evidence that this complex account is required. Rather, a simpler single-process theory can account for both inductive and deductive judgments. Guided by our meta-analysis, we conducted two new experiments in search of evidence of the dual process account. Crucially, two factors were manipulated that might be expected to differentially affect heuristic and analytic processes. Participants judged the strength of written valid and invalid arguments, with separate groups using either inductive or deductive criteria. We factorially manipulated whether the arguments were believable according to background knowledge

	(which should have a greater influence on heuristic processes), and whether participants had received training on how to correctly assess logical validity for the difficult argument forms (which should have a greater influence on analytic processes). We found that though both factors indeed influenced people's inductive or deductive judgments, there was still no evidence that the single-process account should be rejected in favor of the dual process account.

Speaker	Steyvers, Mark
Author 1	Steyvers, Mark UC Irvine
Author 2	Merkle, Ed University of Missouri
Author 3	Mellers, Barbara University of Pensylvania
Author 4	Tetlock, Philip University of Pensylvania
Title	Learning about movie preferences and forecasting abilities in the presence of missing data
Abstract	Missing data is a common problem in modeling and statistical inference. To analyze and learn from incomplete data, assumptions need to be made about the data generating process that generates complete data and the missing data process that explains which elements of the complete data will not be observed. We will present two case studies of where it is important to include choice processes as part of the missing data process. The first case study is in the context of recommender systems (e.g. Netflix, Goodreads) where the goal is to learn about user preferences from a set of items (e.g. movies, books) that are rated by the user. The items to be rated are chosen by the user and are not randomly picked by an experimenter. We will present a topic model that includes a probabilistic process for the choice of items to rate as well as a process for selecting a rating for those items. These topic models can learn about user preferences from just knowing which items were rated even in the absence of any explicit ratings. The second case study is based on a large-scale forecasting tournament where users choose the forecasting problems they work on and for each problem, they provide a probabilistic forecast. We show how an Item Response Theory (IRT) can be generalized to not only handle continuous probabilistic forecasts but also the choice of items for which users forecast. We show how the selected forecasting problems from each forecaster provides a new source of data for estimating forecaster ability. Generally, the two case studies suggest that missing data due to choice processes present computational challenges (how do we model the choice processes) but also opportunities to gain additional information

Speaker	Teodorescu, Kinneret
Author 1	Plonsky, Ori Technion - Israel Institute of Technology
Author 2	Teodorescu, Kinneret Indiana University
Author 3	Erev, Ido Technion - Israel Institute of Technology
Title	Reliance on small samples, the wavy recency effect and similarity-based learning
Abstract	Many behavioral phenomena, including underweighting of rare events and probability matching, can be the product of a tendency to rely on small samples of experiences. Why would small samples be used, and which experiences are likely to be included in these samples? Popular learning models assume reliance on the most recent experiences due to cognitive limitations and/or adaptation to gradually changing environments. We explore a very different and more cognitively demanding process explaining the tendency to rely on small samples: exploitation of environmental regularities. In computational analyses we show that across wide classes of environments, focusing only on experiences that followed the same sequence of outcomes preceding the current task is more effective than focusing on the most recent experiences. We then examine the psychological significance of these sequence-based models. Most learning models predict that the impact of each outcome will be maximal immediately after its occurrence, and will diminish monotonically with time (positive recency). In contrast, sequence-based rules predict a non-monotonic development over time with three distinct stages: The initial effect is negative, then it becomes positive, and finally, in the long term, the effect diminishes. Analysis of published data supports this non-trivial wavy recency pattern and shows robust sequential dependencies ignored by previous research. For example, the tendency to underweight a rare event is found to be strongest three trials after its occurrence. Thus, despite their cognitive cost, sequence-based models have appealing descriptive value. Implications to similarity-based learning and learning models in general will be discussed.

Speaker	Teodorescu, Andrei
Author 1	Teodorescu, Andrei Psychological and Brain Science, Indiana University
Title	Falsifying unfalsifiable models - grounding model inputs in stimulus

	values rather than free parameters
Abstract	In 2013, two papers were published in Psychological Review pointing out the crucial problem of model mimicry within the sequential sampling model class and its origin in arbitrary technical model assumptions. However, while the work by Jones & Dzhafarov concludes that the entire class is unfalsifiable, the work by Teodorescu & Usher endeavors to provide a framework of theoretically driven experimental design which generates non-overlapping, and thus falsifiable, predictions from different models. How can such opposed conclusions co-exist? In this talk I will try to bridge the two works by discussing the similarities and differences and illustrate the value of emerging insights in a follow up study to Teodorescu & Usher (2013). The hallmark of experimental psychology has been the use of clever experimental designs to flush out differences between theories and compare their predictions. The hallmark of cognitive modeling has been the use of clever mathematical and computational models that can account for the experimental results. In the void between these two enterprises lay assumptions that are necessary for linking models with experiments. The most fundamental of these are the "selective influence" assumptions which confine the effects of a particular manipulation to a unique set of model parameters. Common practice allows parameters to vary freely with their selectively influencing experimental manipulations. I will try to argue and demonstrate that this freedom is excessive and that constraining momentary model input values to momentary stimulus values can allow us to avoid model mimicry and improve model selection.

Speaker	van Ravenzwaaij, Don
Author 1	Van Ravenzwaaij, Don University of Newcastle
Author 2	Brown, Scott University of Newcastle
Author 3	Marley, Anthony University of Victoria
Author 4	Heathcote, Andrew University of Newcastle
Title	The Advantage Linear Ballistic Accumulator: A New Model for Multi-Alternative Forced Choice Tasks
Abstract	Over the last few decades, cognitive psychology has seen an advent of sequential accumulator models that aim to fit response time data from forced choice tasks. When the number of response options is higher than two, these models tend to posit one accumulator per response option: evidence accumulation is conceptualized as absolute evidence for one response option. Here, we propose a new model for sequential evidence accumulation in which evidence is

	collected relative to other response options: the advantage linear ballistic accumulator. In the first part of this paper, we present three kinds of model architectures that differ in terms of the conditions that have to be met for a response to be chosen. We demonstrate in model simulations that all of these architectures naturally produce Hick\'s Law (Hick, 1952). In the second part, we present fits of one model architecture (the Win-All model) to an empirical Hick\'s Law dataset. In the third part of the paper, we discuss a recent claim by (Teodorescu & Usher, 2013), that in order to account for some empirical multi-alternative forced choice data, sequential accumulator models need mutual inhibition. We present fits of the Win-All model that does not include mutual inhibition to data by Teodorescu and Usher (2013).

Speaker	Vul, Ed
Author 1	Vul, Ed UCSD Psychology
Author 2	Lew, Timothy F UCSD Psychology
Title	How visual working memory exploits environmental structure.
Abstract	How do people use the structure of items when storing them in visual memory? Experiment 1 asked what format visual working memory uses to encode objects and their structure. Subjects saw objects arranged in different spatial clustering structures and recalled their positions. Objects in the same cluster were misreported in similar directions, indicating that memory errors were shared within clusters. Additionally, the shared errors for clusters decreased when clusters were closer. These results are captured by a model that encodes object positions relative to an inferred grouping structure and recalls relative positions with Weber noise. Experiment 2 adopted an iterated learning paradigm to amplify biases due to people's prior expectations about spatial structure. Each subject saw 15 items and reported their positions; critically, the positions one subject reported served as the stimulus for the next subject. People converged to reporting items in few groups that are either tight clusters or lines, and multiple lines in a display with similar orientations and lengths. This effectively recovers visual memory's use of Gestalt principles to encode objects. Together, these results show how people use environmental structure to remember displays: what structures they expect and exploit, and what format encodes objects and their structure.

Speaker	Wagenmakers, Eric-Jan
Author 1	Wagenmakers, Eric-Jan University of Amsterdam

Title	Statistical Inference for Irrelevant Data
Abstract	When two models make identical predictions for a particular set of observations, this set is called irrelevant, as it cannot be used to discriminate the models. Based on earlier work by Harold Jeffreys, I demonstrate that the first binomial observation is irrelevant for discriminating H0 (theta = 1/2) from H1 (theta ~ symmetric around 1/2). Then I demonstrate that the nth binomial observation is likewise irrelevant, provided that the n-1 previous observations are split evenly between successes and failures. Finally, I generalize the concept of irrelevance by introducing Maximally Uninformative Data (MUD) sequences; given a particular prior distribution, there exists a matching MUD sequence, that is, an infinitely long sequence of observations for which the predictive adequacy of H0 equals that of H1 throughout. Interestingly, all MUD sequences will yield p < alpha for any alpha, and all MUD sequences will produce confidence intervals that do not overlap with the parameter under test. This behavior can be explained by interpreting the p-value in Bayesian terms.

Speaker	Zeelenberg, Rene
Author 1	Zeelenberg, Rene Erasmus University Rotterdam zeelenberg#fsw.eur.nl
Author 2	Pecher, Diane Erasmus University Rotterdam
Title	The Role of the Motor System in Short-Term and Long-Term Memory for Objects and Words
Abstract	It has been suggested that action is central to cognition. Recent studies suggest that actions may be automatically activated by objects and words (e.g., Tucker & Ellis, 2001), but little is known about the role of the motor system in short-term and long-term memory. Shebani and Pulvermüller (2013) recently reported evidence supporting a role for motor simulations in immediate serial order recall for words. In their study, movements with the hands impaired working memory for arm-related action words (e.g., grab, stir) and movements with the feet impaired working memory for leg-related action words (e.g., kick, skate). We report several experiments that investigated whether similar effects are present in other short-term and long-term memory tasks.

Speaker	Zhang, Shunan
Author 1	Zhang, Shunan UCSD

Author 2	Song, Amanda UCSD
Author 3	Yu, Angela UCSD
Title	A Bayesian hierarchical model of crowding: a case study of global-local processing in visual perception
Abstract	We explore the interaction between global-local information processing in visual perception, using a visual phenomenon known as crowding, whereby the perception of a target stimulus is impaired by the presence of nearby flankers. The majority of established models explain the crowding effect in terms of local interactions. However, recent experimental results indicate that a classical crowding effect, the deterioration in the discrimination of a vernier stimulus embedded in a square, is alleviated by additional squares (\\\"uncrowding\\\"). Here, we propose that crowding and uncrowding arise from abstract neural inferences about hierarchically organized groups, and formalize this hypothesis using a hierarchical Bayesian model. We show that the model reproduces both crowding and uncrowding; more generally, the model provides a normative prescription for how visual information might show bottom-up, top-down, and laterally, to allow the visual system to simultaneously and interactively process global and local features in the visual scene.

Speaker	Zhang, Byoung-Tak
Author 1	Zhang, Byoung-Tak Seoul National University
Title	Reverse Engineering the Embodied Mind by Human Robotics
Abstract	Behaviorism has focused on measurable stimulus-response relationships of human behavior while ignoring cognition. In contrast, cognitivism has focused on the internal information processing mechanisms of the mind while ignoring the body and action. Recent studies in cognitive science emphasize the embodied mind and its interaction with the environment within the perception-action cycle. However, many researchers believe that, despite its significance, the progress of the embodied and situated mind research would be quite slow due to the technical difficulties of sensing and modeling the experimental data in real worlds. In this talk we argue that the emerging wearable technology, such as smart glasses and wearable EEG devices, and machine learning come to the rescue. Based on this idea, we present a new research paradigm for reverse engineering the embodied mind (i.e. understanding human thoughts and acts) in ecologically-valid environments using wearable devices and robotics technology. The proposed “human robotics” approach to cognitive science views the wearable devices as robots that continually sense and track the everyday activity of

the wearers (a “wearable robotics” problem from the robotics point of view). Using machine learning technology combined with mobile and cloud computing, the wearable robots attempt to reproduce or “clone” the human mind and behavior in real-world in real-time over an extended period. We take the mindcloning problem as an example to illustrate the human robotics paradigm and discuss its experimental setups, applications, prospects, and the challenges in cognitive modeling.

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