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# 2nd Joint Meeting of the SEPC and the ISCP

**XXIVth International Congress of the Spanish Society for Comparative Psychology**

**XVIth Biennial Meeting of the International Society for Comparative Psychology**

**Jaén**
**September 2012**

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# Meeting Time Table

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## Wednesday, September 12

**Morning**

| | | |
|---|---|---|
| 9:00-9:30 | Registration | *Aula Magna* |
| 9:30-10:00 | Inauguration of the meeting | *Aula Magna* |
| 10:00-11:15 | Inaugural lecture – Mark Bouton | *Aula Magna* |
| 11:15-11:30 | Break | |
| 11:30-12:50 | Symposium 1: Mechanisms of extinction…. | *Aula Magna* |
| 12:50-14:10 | Symposium 2: Hippocampal circuit and functions…. | *Aula Magna* |

**Afternoon**

| | | |
|---|---|---|
| 14:15-15:30 | Lunch | *Cafeteria C4* |
| 15:30-16:50 | Coffee – Poster session I | *C5* |

**Evening**

| | | |
|---|---|---|
| 17:00-18:15 | Talk Session 1A *(Neurobiological…)* | *Meeting Room – D1* |
| | Talk Session 1B *(Social Behavior)* | *Degree Room – D1* |
| 18:15-19:30 | Talk Session 2A *(Behavioral Control)* | *Meeting Room – D1* |
| | Talk Session 2B *(Contingency Learning…)* | *Degree Room – D1* |

**Night**

| | |
|---|---|
| 21:30 | Reception cocktail (open bar) at the Albegue Inturjoven & Spa Jaén Hostel. *How musical is a comparative psychologist* , by Jazz Performer Félix Vico. |

## Thursday, September 13

**Morning**

| | | |
|---|---|---|
| 9:00-10:20 | Symposium 3: Associative interference…. | *Aula Magna* |
| 10:20-11:40 | Symposium 4: Flavor learning | *Aula Magna* |
| 11:40-12:15 | Break and Group picture | |
| 12:15-13:30 | SEPEX Lecture – Helena Matute | *Aula Magna* |

**Afternoon**

| | | |
|---|---|---|
| 13:30-15:00 | Lunch | *Cafeteria C4* |
| 15:00-16:30 | Coffee – Poster session II | *C5* |

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**Evening**

| | | |
|---|---|---|
| 16:30-17:45 | Talk Session 3A *(Timing)* | *Meeting Room – D1* |
| | Talk Session 3B *(Spatial learning)* | *Degree Room – D1* |
| 17:45-19:15 | Talk Session 4A *(Animal cognition)* | *Meeting Room – D1* |
| | Talk Session 4B *(Exposure effects)* | *Degree Room – D1* |

## Friday, September 14

**Morning**

| | | |
|---|---|---|
| 9:00-10:20 | Symposium 5: Taste memory and taste aversion | *Aula Magna* |
| 10:20-12:00 | Symposium 6: Some comparative Psychology… | *Aula Magna* |
| 12:00-12:15 | Break | |
| 12:15-13:15 | Symposium 7: What is working memory… | *Aula Magna* |
| 13:15-14:30 | Presidential Address: Aaron Blaisdell | *Aula Magna* |

**Afternoon**

| | | |
|---|---|---|
| 14:30-15:45 | Lunch | *Cafeteria C4* |
| 15:50-16:50 | Talk Session 5A *(Cue competition)* | *Meeting Room – D1* |
| | Talk Session 5B *(Context, extinction…)* | *Degree Room – D1* |

**Evening**

| | | |
|---|---|---|
| 17:00-18:15 | Closing Conference: Anthony Dickinson | *Aula Magna* |
| 18:15-18:30 | Nancy Innis Award winner selection | *Aula Magna* |
| 18:30-19:00 | *Meeting of ISCP* | *Aula Magna* |
| 19:00-19:30 | *Meeting of SEPC* | *Aula Magna* |

**Night**

| | |
|---|---|
| 22:00 | Closing dinner at the National Parador |

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# Programme

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# WEDNESDAY, SEPTEMBER 12

## INAUGURAL LECTURE/ 10:00-11:15/ AULA MAGNA

**Mark Bouton**

**Contextual Control of Operant Extinction Learning**

**Introduced by Juan M. Rosas**

## SYMPOSIUM 1/ 11:30-12:50/ AULA MAGNA

**Mechanisms of extinction and recovery from extinction**

**Coordinator:** Mario A. Laborda and Ralph R. Miller

**Discussant:** Geoffrey Hall

**1**

**Title**: Stimulus-like roles of contexts in extinction

**Authors**: Mario A. Laborda, Cody W. Polack, & Ralph R. Miller

**2**

**Title**: Mechanisms of response recovery with changes in context

**Author**: James B. Nelson

**3**

**Title**: Is there anything special about context dependence of extinction?

**Authors**: Juan M. Rosas, A. Matías Gámez, J. Alejandro Aristizábal, & Samuel P. León

**4**

**Title**: Extinction and stimulus competition: two of a kind?

**Author**: Bram Vervliet

## SYMPOSIUM 2/ 12:50-14:10/ AULA MAGNA

**Hippocampal circuit and functions in rodents**

**Coordinator and Discussant:** Shogo Sakata

**1**

**Title**: Major histocompatibility complex class I molecules regulate asymmetry in hippocampal circuitry

**Author**: Isao Ito

**2**

**Title**: Degu's hippocampus plays the role not only in the spatial recognition, but also in the social recognition

**Authors**: Tomoko Uekita, & Kazuo Okanoya

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**3**

**Title**: Hippocampal acetylcholine efflux is enhanced during negative patterning discrimination task compared with elemental discrimination task in rats

**Author**: Toshimichi Hata

**4**

**Title**: A comparison of hippocampal theta activity between configural and non-configural tasks

**Authors**: Yuya Sakimoto, & Shogo Sakata

## POSTERS SESSION I/ 15:30-16:50/ C-5

## Memory and Cognition

**MC-1**: Spontaneous object recognition memory in aged rats: complexity versus similarity

**Authors**: Gámiz, F., & Gallo, M.

**MC-2**: A demonstration of Episodic-like Memory in one trial with preschool children

**Authors**: Angélica Alvarado, Rosalba Juárez, Karla Méndez, & Javier Vila

**MC-3**: Spatial memory in hamsters: The role of pre-choice behaviors in the Radial Arm Maze

**Authors**: Maryed Rojas Leguizamón, Nataly Yáñez, & Felipe Cabrera

**MC-4**: Dynamic average of negative value experiences in information retrieval

**Authors**: Luis Jesús López-Romero, Karina Segura-Flores, Angélica Alvarado-García, & Javier Vila

**MC-5**: Developmental trajectories of working memory in young, adolescent, and adult chimpanzees

**Author**: Sana Inoue

**MC-6**: Numerical competence in angelfish: the influence of non-numerical cues on shoal size choice

**Author**: Luis M. Gómez Laplaza

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**MC-7**: Designing tasks for testing Theory-of-Mind abilities in dogs (*Canis lupus familiaris*)
**Authors**: Teresa Marías Luca de Tena, Federico Guillén-Salazar, & Fernando Colmenares

**MC-8**: Relevance of intra and extra-maze visual cues for spatial orientation in the toad *Rhinella arenarum*
**Authors**: Rubén N. Muzio, Florencia Daneri, & Emma B. Cassanave

## Pre-exposure Learning

**PL-1**: Stimulus pre-exposure effect on generalization of conditioned taste aversion in rats assessed by the differential scores
**Authors**: Rocío Angulo, & Gumersinda Alonso

**PL-2**: Analysis of the associative and non-associative hypotheses of the US-preexposure effect in infant rats.
**Authors**: Arias, C., Gaztañaga, M., & Chotro, MG

**PL-3**: Stimulus pre-exposure and stimulus recognition in humans
**Authors**: Naiara Arriola, Antón Navarro, Asier Martierena, Mª del Carmen Sanjuán, Joxean Iraola, & Gumersinda Alonso

**PL-4**: The taste preexposure effect in humans using a detection task.
**Authors**: José A. Cabello Cabello, Manuel M. Ramos-Álvarez, Teresa L. Martín-Guerrero, & Concepción Paredes-Olay

**PL-5**: Latent inhibition and facilitation of conditioned taste aversion in infant rats
**Authors**: Mirari Gaztañaga, Elena Díaz-Cenzano, Carlos Arias, & M. Gabriela Chotro

**PL-6**: The US-preexposure effect with an appetitive procedure: Exploring the role of motivational factors
**Authors**: Marta Gil, Michelle Symonds, Geoffrey Hall, & Isabel de Brugada

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**PL-7**: Do exist differences in latent inhibition between high and low drinkers in schedule induced polydipsia?
**Authors**: Navarro, S. V., Álvarez , R., Moreno, M., Gutiérrez-Ferre, V. E. & Flores, P.

## Time and Context

**TC-1**: Contextual dependence of non-extinguished learning in rats appears when the extinction experience takes place within a different task
**Authors**: Bernal-Gambo, R., Rosas, J. M. , & Callejas-Aguilera, J. E.

**TC-2**: An Extinction Cue fails to prevent ABA Renewal in Human Predictive Learning
**Authors**: Javier Bustamante Alvarez, Harald Lachnit, & Metin Uengoer

**TC-3**: Evaluation of the context-outcome association in the context switch effect in human instrumental conditioning using a transfer test
**Authors**: Gámez, A. M., León, S. P., & Rosas, J. M.

**TC-4**: Lithium-induced context conditioning as measured by consumption and taste reactivity
**Authors**: Gasalla, P.; Soto, A; Tellander, S., & López, M.

**TC-5**: ABA and AAB renewal in discriminant operant procedure with rats.
**Authors**: León, S. P., Vurvic, D., Todd, T., & Mark E. Bouton

**TC-6**: Human ABA and AAB renewal in a predictive learning task.
**Authors**: Moreno-Fernández, M. M.; León, S., P.; Callejas-Aguilera, J. E., & Rosas, J. M.

**TC-7**: Extinction and within-session spontaneous recovery of incubated fear in a conditioned freezing preparation
**Authors**: Vargas-Irwin, C., Pérez-Acosta, A. M., & Martínez, G. S.

**TC-8**: Generalization and spontaneous recovery of incubated fear in a conditioned freezing preparation
**Authors**: Vargas-Irwin, C., Pérez-Acosta, A. M., & Gladys S. Martínez, G. S.

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## Discrimination, Attention, and Consciousness

**DAC-1**: Limitations of the oblique effect in pigeons
**Authors**: Donis, F. J., Moffitt, M., & Nava, J.

**DAC-2**: The Long + Effect as Demonstrated by Humans Playing a Video Game
**Authors**: Suzette L. Astley, & Mark E. Bouton

**DAC-3**: The use of continuous variables by angelfish (Pterophyllum scalare) in a quantity discrimination task
**Author**: Luis M. Gómez Laplaza

**DAC-4**: The role of external feedback in visual easy-to-hard effect.
**Authors**: Moreno-Fernández, M. M.; León, S. P., & Rosas, J. M.

**DAC-5**: Methodological improvements in the conscious will clock paradigm: larger action-effect intervals and different assessment questions
**Authors**: Pablo Garaizar, Carmelo P. Cubillas, & Helena Matute

**DAC-6**: The eyes have it!! Stroop spatial interference with real but not with schematic gazes
**Authors**: Colmenero, J. Mª, Ortega, A. R., Ramírez, E. García-Viedma, R., & Montes, R.

## Social Learning

**SL-1**: Habituation of the sexual response in Japanese quail
**Authors**: Juan Carlos Riveros, Andrés Ballesteros, & Germán Gutiérrez

**SL-2**: "Inferring reputation" from third-party interactions in domestic dogs (Canis familiaris)
**Authors**: Mariana Bentosela, Esteban Freidin, & Alba E. Mustaca

**SL-3**: Social hierarchy, learning, and sexual selection in Coturnix japonica
**Authors**: Germán Gutiérrez, Bibiana Montoya, & Laura Suárez

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**SL-4**: Social Enrichment Affects Suboptimal, Risky, Gambling-Like Choice by Pigeons
**Authors**: Jennifer R. Laude, Kristina F. Pattison, & Thomas R. Zentall

**SL-5**: Social interaction and conditional self-discrimination under effects of methylphenidate in norvegicus rats
**Authors**: Julio C. Penagos Corzo, Cristina Hermosillo, & Andrés M. Pérez-Acosta

**SL-6**: Do dogs discriminate between pro-social and anti-social human behavior?
**Authors**: Trojan, Maciej, Reinholz-Trojan, Anna, & Włodarczyk, Ewelina

## TALK SESSION 1A/ 17:00-18:15/ MEETING ROOM-D1
## Neurobiological approaches to learning and memory

**Title**: Cambios en la expresión c-Fos cerebral tras la extinción de la memoria espacial.
**Authors**: Méndez -Couz M., Conejo N. M., Fidalgo C., Vallejo G., & Arias J. L.

**Title**: Involvement of striatal dorsolateral in automatic control processes.
**Authors**: Quintero, E., Mena, A., Barroso, A., Vargas, J.P, Díaz, E. & López, J.C.

**Title**: Novel evidence for a role of the bed nucleus of the stria terminalis in the expression of contextual anxiety in rats
**Authors**: Laura Luyten, Deb Vansteenwegen, Kris Van Kuyck, Cindy Casteels, Michel Koole, Koen Van Laere, & Bart Nuttin

**Title**: The prefrontal cortex, attention, and memory for the location of events.
**Authors**: Andrew Talk, Rebecca Parnell, & Katrina Grasby

**Title**: Behavioral effects of dopaminergic agents on schedule-induced drinking in the Spontaneously Hypertensive Rat, Wistar Kyoto rats and normal Wistar rats
**Authors**: Javier Íbias, & Ricardo Pellón

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## TALK SESSION 1B/ 17:00-18:15/ DEGREE ROOM-D1
## Social Behavior

**Title**: Vertebrate Predators May Share Facial Characteristics Providing Opportunities for Detection by Prey
**Authors**: Jesse E. Purdy, & Kelly Finn

**Title**: Applied Behavioral Management of Captive Nonhuman Primates
**Authors**: Steven J. Schapiro, & Susan P. Lambeth

**Title**: Social aspects of acquisition and transmission of illusion of control
**Authors**: Marcelo Benvenuti, Flávia Meneses-duarte, & Saulo Missiaggia-Velasco

**Title**: La tríada *personalidad-aprendizaje de inversion-adicción*: Patrones diferenciales para el juego patológico y la adicción a la cocaína
**Authors**: Ana Torres, Alberto Megías, Andrés Catena, & José César Perales

**Title**: La valencia emocional afecta diferencialmente a la severidad de los juicios morales
**Authors**: Luis de la Viña, David Garcia-Burgos, Antonio Cándido, & Felisa González

## TALK SESSION 2A/ 18:15-19:30/ MEETING ROOM-D1
## Behavioral control

**Title**: Self-control processes in humans and dogs: Effect of glucose and fructose
**Author**: Miller, Holly C.

**Title**: Response frequency mediates the depressive realism effect: Statistical and experimental evidence
**Authors**: Fernando Blanco, Helena Matute, & Miguel A. Vadillo

**Title**: Reinforcement of schedule-induced drinking in rats by lick-contingent shortening of food delivery
**Authors**: Beatriz Álvarez, Javier Íbias, & Ricardo Pellón

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**Title**: Mecanismos serotoninérgicos en la vulnerabilidad a la bebida compulsiva en polidipsia inducida por programa
**Authors**: Valeria Edith Gutiérrez-Ferre, Margarita Moreno, Silvia Navarro, & Pilar Flores

**Title**: La Suplementación Crónica con Colina Dietaria Modula el Cambio Atencional en Ratas Adultas
**Authors**: Hayarelis Moreno, Isabel de Brugada, & Geoffrey Hall

## TALK SESSION 2B/ 18:15-19:30/ DEGREE ROOM-D1
## Contingency learning and decision making

**Title**: El efecto del Feedback en la evaluación y toma de decisiones en el comportamiento de riesgo.
**Authors**: Alberto Megías, Antonio Maldonado, Andrés Catena, & Antonio Cándido

**Title**: Learning processes engaged during human contingency learning measured with recognition priming comply with basic associative theories
**Authors**: Joaquín Morís, Pedro Luís Cobos, David Luque, & Francisco José López

**Title**: Summation or average? Evidence that people use the simplest non-normative strategies when combining causes
**Authors**: Nerea Ortega-Castro, Itxaso Barbería, Miguel Ángel Vadillo, & A. G. Baker

**Title**: Summing the influence of independently trained causes
**Authors**: Itxaso Barberia, Nerea Ortega-Castro, Miguel Ángel Vadillo, & Andy G. Baker

**Title**: US magnitude and psychophysical perception of contingency
**Authors**: Carnero, S., Morís, J., Acebes, F., Álvarez, B., & Loy, I.

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# THURSDAY, SEPTEMBER 13

## SYMPOSIUM 3/ 9:00-10:20/ AULA MAGNA
## Associative interference: Boundaries, mechanism, and commonalities to other associative phenomena

**Coordinator:** Gonzalo Miguez
**Discussant:** Helena Matute

**1**

**Title**: Analogies and relations between associative cue interference and cue competition
**Authors**: Gonzalo Miguez, Lisa Mash, Mario Laborda, & Ralph R. Miller

**2**

**Title**: Boundary conditions for interference between cues in human contingency learning
**Authors**: David Luque, Joaquín Morís, Pedro L. Cobos, & Francisco J. López

**3**

**Title**: The role of inhibition in interference between cues and between outcomes: Inhibitory associations or inhibited representations?
**Authors**: Miguel A. Vadillo, Nerea Ortega-Castro, Cristina Orgaz, David Luque, Pedro L. Cobos, Francisco J. Lópe,z &Helena Matute

**4**

**Title**: Associative mechanisms during conditioned inhibition training revealed in high-schizotypy individuals
**Author**: Irina Baetu

## SYMPOSIUM 4/ 10:20-11:40/ AULA MAGNA
## Flavour learning

**Coordinator:** Robert Boakes
**Discussant:** Geoffrey Hall

**1**

**Title**: When is postingestive reward detected? Both rapid and delayed postingestive effects of nutrients contribute to learned flavor preference.
**Author**: Kevin P. Myers

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**2**

**Title**: Pigs' flavour preferences conditioned by the effects of prenatal environment, nutrients and social interactions.

**Author**: Jaime Figueroa

**3**

**Title**: CS-exposure effect in simultaneous flavour-nutrient conditioning: extinction and latent inhibition

**Author**: Felisa González, David García-Burgos, & Geoffrey Hall

**4**

**Title**: Understanding the nature of sensory preconditioning through an analysis of licking

**Authors**: Robert C. Honey, Katy V. Burgess, & Dominic M. Dwyer

## SEPEX LECTURE/12:15-13:30/ AULA MAGNA

**Helena Matute**

**The Illusion of Causality**

**Introduced by Francisco J. López**

## POSTERS SESSION II/ 15:00-16:30/ C-5

### Neurobiological Basis of Behavior

**NBB-1**: Study of acute and chronic anxiogenic effect of yohimbine in Wistar rats

**Authors**: M. L. de la Torre, E. Alegre, I. Plazuelo, V. Romero, M.D. Escarabajal, & A. Agüero

**NBB-2**: Influence of sex, time in safety and psychogenetic selection in one-way avoidance learning

**Authors**: Donaire, R., Sabariego, M., Gómez, M.J., Fernández-Teruel, A. , & Torres, C.

**NBB-3**: Propranolol´s role in reward´s memory impairment

**Authors**: Eliana Ruetti, Nadia Justel, Mariana Psyrdellis, Esteban Freidi, Mariano Boccia, & Alba Mustaca

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**NBB-4**: Thalamic taste area Fos-like immunoreactivity during taste-recognition memory in amygdala lesioned rats.
**Authors**: Morillas, E., Gómez-Chacón, B, Gámiz, F. and Gallo, M.

**NBB-5**: Hippocampal gene expression after a frustrating experience of reward devaluation in inbred Roman High- (RHA-I) and Low- (RLA-I) Avoidance rats.
**Authors**: M. Sabariego, R. Donaire, M. J. Gómez, A. Fernández-Teruel, I. Morón, F. Esteban, J.A. Conejero, & C. Torres

**NBB-6**: Modulation of spine density by schedule-induced polydipsia in anterior prefrontal cortex neurons
**Authors**: Estrella Soria, Javier Íbias, Asta Kastanauskaite, Úrsula Morillo, Cristina Orgaz, Javier DeFelipe, Ricardo Pellón, & Miguel Miguéns

**NBB-7**: Hemispheric Specialization in Dogs for Processing of Acoustic Stimuli
**Authors**: Trojan, Maciej, Reinholz-Trojan, Anna, Włodarczyk, Ewelina, Stefańska, Joanna, & Piwko, Katarzyna

**NBB-8**: Neuronal representation of 3d characteristics of the environment in the hippocampal system of the rat
**Authors**: J.P. Vargas, M. Bovet, M. Portavella, & J.C. López

## Motivation, Reinforcement, and Behavior

**MRB-1**: Behavioral supports: A Comparative Analysis
**Authors**: Felipe Cabrera, Ángel Jiméne,z & Pablo Covarrubias

**MRB-2**: Effort discounting in humans
**Authors**: Inês Fortes, & Armando Machado

**MRB-3**: Self-control with negative punishment in pigeons
**Authors**: V. Pérez, E.Polín, C.Carrero, T.Moreno, & M.S. Vicente

**MRB-4**: Consummatory successive negative contrast in infant rats.
**Authors**: Andrea Suárez, Alba Mustaca, Ricardo Pautassi, Esteban Freidin, & Giselle Kamenetzky

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**MRB-5**: Effects of motivational states on acquisition and extinction of conditioned flavor preference in rats.
**Author**: Takahisa Masaki

**MRB-6**: Preference/avoidance for flavoured solutions signalling presence/absence of ethanol and alcohol deprivation effect using a voluntary-consumption paradigm in rats
**Authors**: Estefanía Orellana Barrera, Liz Gabriela Lesta, Paula Abate, & Felisa González

**MRB-7**: Successive negative contrast and stress hormone levels in rats
**Authors**: Marta Sabariego, Rocío Donaire, Humberto Gagliano, Mª José Gómez, Ignacio Morón, Inmaculada Márquez, Bernabé Gómez, Francisco Javier Cano, Almudena Yébenes, Alberto Fernández-Teruel, Antonio Armario, Roser Nadal, & Carmen Torres

## Associative Learning

**AL-1:** Overshadowing of non-geometrical cues in spatial learning with human participants
**Authors:** Alberto Monroy, David Luna, Javier Vila, & Angélica Alvarado

**AL-2:** Overshadowing of non-geometrical cues decrease after a retention interval
**Authors:** David Luna, Alberto Monroy Javier Vila, & Angélica Alvarado

**AL-3:** The relevance of the within-compound associations in backward blocking: strengthening the within-compound associations through the insertion of training phases.
**Authors:** Amanda Flores, David Luque, & Miguel A. Vadillo

**AL-4:** Extinction of appetitive conditioning in Helix aspersa
**Authors:** Ana Fernández-Pérez, Ignacio Neis, Joaquín Morís & David Luque

**AL-5:** The S-O association after extinction in human instrumental conditioning.
**Authors:** A. Matías Gámez, Samuel P. León, & Juan M. Rosas

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**AL-6:** The associative nature of flavor-flavor learning using quinine as US
**Authors:** Sergio A. Recio, Marta Gil, & Isabel de Brugada

**AL-7:** Odor preference and odor avoidance induced by amphetamine depending on the testing modality.
**Authors:** Revillo, D.A., Fernandez, G., Castello, S., Paglini, M.G., & Arias, C.

**AL-8:** An evaluation of taste palatability in flavor preference using the taste reactivity test
**Authors:** Soto A., Gasalla P., Bura S., & López M.

**AL-9:** Radial maze learning in tortoises (Agrionemys horsfieldii)
**Author:** Tohru Taniuchi

## Extensions and Applications of Learning

**EAL-1:** Parametric analysis of salty taste perception under different conditions of feedback
**Authors:** Teresa L. Martín-Guerrero, Concepción Paredes-Olay, Juan M. Rosas, & Manuel M. Ramos-Álvarez

**EAL-2:** Illusion of control in pathological gamblers
**Authors:** Orgaz, Cristina, Estévez, Ana, & Matute, Helena

**EAL-3:** The behaviour of children with autism in a new environment
**Author:** Ewa Pisula

**EAL-4:** Three-dimensional vision aptitude predicts student's academic results in Geology teaching laboratories: An example of how experimental psychology methods may be transferred to other Sciences
**Authors:** Manuel M. Ramos-Álvarez, Mario Sánchez-Gómez, Alejandro Aristizábal, Luis A. Pérez-Valera, Teresa L. Martín-Guerrero, & Juan M. Rosas

**EAL-5:** Personal involvement vs. response frequency as an explanation for the illusion of control.
**Authors:** Yarritu I., Matute H., & Vadillo M.A.

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## TALK SESSION 3A/ 16:30-17:45/ MEETING ROOM-D1
## Timing

**Title**: Effects of a non-relevant duration on time perception
**Authors**: Andréia Kroger-Costa, John Wearden, & Armando Machado

**Title**: When does integration of temporal maps take place?
**Authors**: Mikael Molet, Gonzalo Miguez, & Ralph R. Miller

**Title**: How long is a piece of time? Searching for context effects.
**Authors**: Marilia Pinheiro de Carvalho, Armando Machado, & François Tonneau

**Title**: Temporal discrimination in pigeons: Coding strategies
**Authors**: Carlos Pinto, & Armando Machado

**Title**: Temporal control: Relative or Absolute
**Author**: Armando Machado

## TALK SESSION 3B/ 16:30-17:45/ DEGREE ROOM-D1
## Spatial Learning

**Title**: El papel de la forma del objeto en la conducta exploratoria de ratas: relevancia de vértices y aristas.
**Authors**: Martínez-Escudero, L., Gámiz, F., & Gallo, M.

**Title**: Sexual maturation influences the strategies used by female rats to solve a navigation task
**Authors**: Clara A. Rodríguez, V.D. Chamizo, & N.J. Mackintosh

**Title**: Free operant procedure for studying spatial learning in the laboratory rat.
**Author**: Ian N. Johnston

**Title**: Response to spatial and nonspatial change in wild (WWCPS) and Wistar rats
**Authors**: Rafał Stryjek, Klaudia Modlińska, & Wojciech Pisula

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**Title**: Landmark vs. shape learning: new evidence explaining sex differences
**Authors**: V.D. Chamizo, C.A. Rodríguez, & N.J. Mackintosh

## TALK SESSION 4A/17:45-19:15/ MEETING ROOM-D1
## Animal Cognition

**Title**: Adaptative benefits of classsical conditioning of tentacle lowering to find food in snails (helix aspersa)
**Authors**: Loy, Ignacio; Acebes, Félix; Álvarez, Beatriz, & Carnero, Susana

**Title**: Holding familiar information in working memory is cognitively effortful for monkeys
**Authors**: Benjamin M. Basile, & Robert R. Hampton

**Title**: Sequential tool-use in great apes
**Authors**: Gema Martin-Ordas, Lena Schumacher, & Josep Call

**Title**: Control of a continuous response dimension by the numerical stimulus dimension
**Authors**: Eugénia Fernandes, François Tonneau, & Armando Machado

**Title**: Trial-unique matching- and nonmatching-to-sample in honeybees
**Authors**: Gentaro Shishimi, & P. A. Couvillon

**Title**: Cognitive abilities of small passerine birds: common crossbills and blue tits
**Authors**: Tatyana Obozova, Anna Smirnova, & Zoya Zorina

## TALK SESSION 4B/17:45-19:15/ DEGREE ROOM-D1
## Exposure Effects

**Title**: Spatial rather than Feature Learning in Human Visual Perceptual Learning
**Authors**: M. Manuela Moreno-Fernández, & Jose Prados

**Title**: Masking task during stimulus pre-exposure: Perceptual learning or learned irrelevance?
**Authors**: Navarro, A., Arriola, N., Martierena, A. & Alonso, G

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**Title**: The role of the motivational state in the US preexposure effect with an appetitive procedure
**Authors**: Marta Gil, Isabel de Brugada, Michelle Symonds,, & Geoffrey Hall

**Title**: El efecto “Fácil-a-Difícil” con ClLi bebido en ratas
**Authors**: Naiara Arriola, Antón Navarro, Asier Martiarena, & Gumersinda Alonso

**Title**: Transferencia del Aprendizaje Perceptivo a estímulos novedosos tras la preexposición alternada AX / BX
**Authors**: Antonio A. Artigas, & José Prados

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# FRIDAY, SEPTEMBER 14

## SYMPOSIUM 5/ 9:00-10:20/ AULA MAGNA
## Taste memory and taste aversion learning

**Coordinator:** Robert Boakes
**Discussant:** Ignacio Loy

**1**
**Title**: Effects of context on flavour memory
**Authors**: L. G. De la Casa, E. Díaz, A. Fernández, A. Mena, & A. Orgaz

**2**
**Title**: Safe taste memory as a model for the study of recognition memory brain systems
**Authors**: Gómez-Chacón, B., Morillas-González, E., Gámiz, F. ,& Gallo, M.

**3**
**Title**: Serial overshadowing in long delay taste aversion learning
**Authors**: Kwok, D. & Boakes, R.A

**4**
**Title:** Pre-exposure effects and hedonic reactions in taste aversion learning
**Authors:** López, M., Gasalla, P., & Soto, A.

## SYMPOSIUM 6/ 10:20-12:00/ AULA MAGNA
## Some Comparative Psychology: Honoring Jeff Bitterman

**Coordinator and Discussant:** Mauricio R. Papini

**1**
**Title**: Beyond classical conditioning in honeybees
**Author**: Randolf Menzel

**2**
**Title**: Learning and evolution of cognition in amphibians
**Author**: Rubén Muzio

**3**
**Title**: A functional-evolutionary approach to behavioral excess
**Author**: Ricardo Pellón

**4**
**Title**: Is the study of sexual differences comparative in nature?
**Author**: Germán Gutiérrez

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**5**

**Title**: Bitterman's quantitative approach to learning theory
**Author**: Pat A. Couvillon

## SYMPOSIUM 7/ 12:15-13:15/ AULA MAGNA
## What is working memory in nonverbal animals?

**Coordinator and Discussant:** Robert Hampton

**1**

**Title**: Holding familiar information in working memory is cognitively effortful for monkeys
**Authors**: Benjamin M. Basile, & Robert R. Hampton

**2**

**Title**: The Misinterpretation of Retention Functions in Delayed Matching to Sample
**Author**: Thomas Zentall

**3**

**Title**: Memory in the "real" world: a useful avenue for characterising working memory?
**Author**: Susan D. Healy

## ISCP PRESIDENTIAL ADDRESS/ 13:15-14:30/ AULA MAGNA
## AARON BLAISDELL
## Navigating life: Causal maps in the lab and in practice

**Introduced by Mauricio Papini**

## TALK SESSION 5A/ 15:50-16:50/ MEETING ROOM-D1
## Cue competition

**Title**: Blocking in snails, rats and humans using a within-subject design
**Authors**: Jose Prados, Beatriz Alvarez, Ignacio Loy, Felix Acebes, Joan Sansa, & M. Manuela Moreno-Fernández

**Title**: Changes in compound cues modulate information retrieval after interference treatments.
**Authors**: Carmelo P. Cubillas, & Miguel A. Vadillo

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**Title**: Schedule-induced drinking: Blocking and marking effects
**Authors**: Robert Boakes, & Angela Patterson

**Title**: The role of attention in the blocking effect
**Authors**: Francisco Arcediano, & Duncan Y. Amegbletor

## TALK SESSION 5B/ 15:50-16:50/ DEGREE ROOM-D1
## Context, extinction, and neophobia

**Title**: The context effect in a temporal discrimination task with an extended test range
**Authors**: Ana Catarina Vieira de Castro, & Armando Machado

**Title**: Extinction makes conditioning time-dependent
**Authors**: Rodolfo Bernal-Gamboa, José E. Callejas-Aguilera, Javier Nieto, & Juan M. Rosas

**Title**: The extinction of instrumental response impairs the outcome-selective reinstatement, but passage of time does not.
**Authors**: Sánchez-Carrasco, L., García-Hernández, C., & Nieto, J.

**Title**: An associative explanation of lithium-enhanced flavor neophobia.
**Authors**: Marcial Rodríguez, & Zoé García

## CLOSING CONFERENCE/ 17:00-18:15/ AULA MAGNA
## ANTHONY DICKINSON
## The Role of Associative Processes in Goal-Directed Behaviour: A Case for Animal-Human Translational Models
**Introduced by Concepción Paredes-OLay**

## NANCY INNIS AWARD/ 18:15-18:30/ AULA MAGNA

## MEETING OF ISCP/ 18:30-19:00/ AULA MAGNA

## MEETING OF SEPC/ 19:00-19:30/ AULA MAGNA

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# ABSTRACTS

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# CONFERENCES

## INAUGURAL LECTURE

### MARK BOUTON. Contextual Control of Operant Extinction Learning
**Introduced by Juan M. Rosas**

Although extinction in Pavlovian learning is highly context-dependent, less research has systematically investigated the issue in operant learning, a laboratory model of voluntary behavior in the natural world. Recent research in our laboratory has studied the "renewal" effect, in which operant responding returns when the context is changed after extinction. We have produced clear evidence of ABA, ABC, and AAB renewal (where the letters correspond to the contexts of conditioning, extinction, and testing, respectively), even when the learning history of the contexts is controlled. We have also demonstrated renewal in non-deprived rats working for sucrose or sweet/fatty food pellets—the rodent equivalent of junk food. The ABC and AAB renewal effects suggest that extinction is more context-dependent than conditioning, even though operant behaviors themselves can be surprisingly context-specific. Other experiments have studied "resurgence," in which an operant behavior that is extinguished while a second is reinforced recovers when the second behavior is extinguished. This phenomenon persists after extensive extinction training, but can be reduced if reinforcement for the alternative behavior is "thinned" before the final test. Overall, the extinction of operant behavior, like that of Pavlovian behavior, can be highly sensitive to the context, with interesting implications for understanding behavioral inhibition and relapse.

## SEPEX LECTURE

### HELENA MATUTE. The Illusion of Causality
**Introduced by Francisco J. López**

The ability to associate causes to effects is critical for survival. It allows organisms to infer the causes of important events so that they can predict them and modify their probability of occurrence. But this ability is far from perfect and organisms often detect causality where there is only contiguity, which produces illusions and superstitions. For many years researchers in the human and animal contingency learning tradition have suggested that the same mechanisms involved in the detection of contingency are also responsible for the development of causal illusions. This contrasts with the Social Psychology tradition, which has generally focused on the protection of self-esteem and other self-serving biases to explain why many of these illusions develop. I will describe experiments conducted by our research group that explore these issues and address questions on the role of cognitive and behavioral mechanisms versus self-serving biases on causal illusions. Questions about the potential survival value of causal illusions and superstitions will also be discussed.

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## ISCP PRESIDENTIAL ADDRESS

### AARON P. BLAISDELL. Navigating Life: Causal Maps in the Lab and in Practice
**Introduced by Mauricio Papini**

Who are we and where did we come from? Perhaps only a human can ask this question, but we must turn to our animal cousins to seek an answer. The investigation of animal minds can tell us much about how they represent the world around them. I will use my research on cognitive maps as a framework in which to explore the contents of the animal mind in the hopes of learning something about ourselves and our place in nature. Animals seem to share many of our cognitive products and processes, yet there are also large gaps separating us from the rest of the Animal Kingdom. These gaps likely arise from our unique evolutionary history. I will highlight some of the recent advances from anthropology and evolutionary medicine that suggest clues as to why Mankind is so unique, how our uniqueness may be leading to our downfall, and some suggestions as to what to do about it.

## CLOSING CONFERENCE

### ANTHONY DICKINSON. The Role of Associative Processes in Goal-Directed Behaviour: A Case for Animal-Human Translational Models
**Introduced by Concepción Paredes-Olay**

The concept of goal-directed behaviour refers to those actions that are mediated by the interaction between knowledge of the action-outcome contingency and the current incentive value of the outcome. Over the last decade or so, procedures developed within the field of animal learning have informed the investigation of human goal-directed behaviour. Studies using the outcome revaluation procedures show that the goal-directed action develops during the third year in humans and engages the medial prefrontal cortex in both humans and rats. Furthermore, the study of transfer of control and biconditional discriminations points to a role for ideo-motor processes in the goal-directed behaviour of both species. Finally, conflict between different actions appears to engage common control processes. Taken together, this research suggests that humans share basic decision and action selection processes with other animals.

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# SYMPOSIA

## SYMPOSIUM 1
## Mechanisms of extinction and recovery from extinction

**Coordinator:** Mario A. Laborda[1] and Ralph R. Miller[2]
**Affiliation**: [1] University of Chile, Chile / SUNY – Binghamton, USA; [2] SUNY – Binghamton, USA
**Coordinator's email**: mariolaborda@u.uchile.cl
**Summary of the symposium:** The fragile nature of extinction learning has led researchers to evaluate potential mechanisms that might account for the return of extinguished responses under a number of empirical arrangements. Here we present some views and recent data concerning the underlying mechanisms of extinction and its recovery.

**Discussant:** Geoffrey Hall
**Affiliation**: University of York, UK
**Discusant's email**: geoffrey.hall@york.ac.uk

**1**
**Title**: Stimulus-like roles of contexts in extinction
**Authors**: Mario A. Laborda[1], Cody W. Polack[2] & Ralph R. Miller[2]
**Affiliation**: [1] University of Chile / SUNY – Binghamton, USA; [2] SUNY – Binghamton, USA
**Corresponding author email**: mariolaborda@u.uchile.cl
**Abstract**: Behaviorally, a change from the context of extinction to a different context at test produces recovery of the extinguished response (i.e., renewal). Mechanistically, this recovery might be due to a combination of sources. Here we present two recent series of experiments in which we evaluated the potential of the contexts of acquisition, extinction, and testing to play a stimulus-like role in the expression of an extinguished Pavlovian association. First, in a single lick suppression experiment with rats, we evaluated the potential inhibitory role of the context of extinction in ABB and ABC designs. Then, in two experiments using the same preparation, the potential excitatory role of Context A in AAA, AAC, and ABA designs was evaluated. In toto, the experiments reported here suggest that the associative status of the contexts involved in the recovery of an extinguished association following a context shift might be playing stimulus-like roles (i.e., excitatory and inhibitory), in addition to any other potential roles they might be playing (e.g., occasion setting).

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**2**
**Title**: Mechanisms of response recovery with changes in context
**Author**: James B. Nelson
**Affiliation:** University of the Basque Country, Spain
**Corresponding author email**: jamesbyron.nelson@ehu.es
**Abstract**: As in extinction, context appears to become important when new information is conditioned to a stimulus that interferes with what has already been learned about that stimulus. A change in the context where that interfering information is acquired leads to a loss of that learning and an expression of the earlier learning. From such demonstrations, Bouton (1993) assumes that second-learned associations are dependent on the context for retrieval. The talk reviews evidence with animals and humans that assesses mechanisms by which learning can appear to recover with a change in context. Existing and new evidence shows contextual stimuli can act as simple excitors and summate with punctuate CSs. Newer findings show that contexts can act as inhibitors, suppressing responses to punctuate CSs. Cases will be discussed where associations between the context and outcomes are neither necessary nor sufficient to influence behavior to a CS directly, yet the behavior is influenced nevertheless. Recovery following a context change can be multiply determined. In most demonstrations where retrieval failure might be assumed, the degree of recovery due to such contextual control is unknown.

**3**
**Title**: Is there anything special about context dependence of extinction?
**Authors**: Juan M. Rosas, A. Matías Gámez, J. Alejandro Aristizábal, & Samuel P. León
**Affiliation:** University of Jaén, Spain
**Corresponding author email**: jmrosas@ujaen.es
**Abstract**: Response recovery from extinction after a context change has accrued a large interest from both empirical and theoretical perspectives during the last two decades. From a theoretical perspective discussions have been focused on both, the mechanisms of retrieval and the type of information that is affected by the context change. Recovery from extinction after a context change has been explained by contexts controlling responding either through direct associations with the outcome or by modulation of the inhibitory associations between the cue and the outcome, or between the cue and the conditioned response established during extinction. This talk reviews recent research supporting the idea that contexts control behavior whenever subjects pay attention to them, and that the mechanisms through which such control is exerted depends on the situation and task demands, rather than on the specific phenomena that are context dependent. From that theoretical point of view ambiguity produced by extinction and other forms of interference would be just one of the ways in which attention to the contexts is boosted.

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**4**

**Title**: Extinction and stimulus competition: two of a kind?

**Author**: Bram Vervliet

**Affiliation:** University of Leuven

**Corresponding author email**: Bram.Vervliet@ppw.kuleuven.be

**Abstract**: The key feature of extinction is its fragility: extinguished responses easily return under a number of environmental conditions. This has been the major empirical argument for the assumption that extinction relies on a form of inhibition learning (e.g., a CS-noUS association). In this presentation, I will build a bridge towards another area of learning, namely, stimulus competition. In particular, the acquisition of conditioned reactions on CS-US trials can be blocked by the presence of another, already conditioned, CS. However, it has been shown on a few occasions that a blocked CS can start producing the conditioned reaction under comparable conditions as recovery after extinction. I will entertain the possibility that a similar (inhibition) mechanism underlies extinction and blocking. I will present a learning algorithm of this idea and examine its implications (theoretical and clinical). More experiments in human predictive learning are under way.

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## SYMPOSIUM 2
## Hippocampal circuit and functions in rodents

**Coordinator and Discussant:** Shogo Sakata
**Affiliation**: Hiroshima University, Japan
**Coordinator's/Discussant's email**: ssakata@hiroshima-u.ac.jp
**Summary of the symposium**: Rodent hippocampus has clear structure and many cognitive functions with learning and memory. We discuss hippocampal circuit and their functions in mouse, degu and rat. First, Prof. Ito presents asymmetries in the mouse hippocampal circuitry. Second, Prof. Uekita talks about the spatial recognition ability and social recognition using with hippocampus lesion technique in degu. Third, Prof. Hata shows Ach efflux changing on the task difficulty in learning conditions of rat. Their task performance depends on circuit activity with acetylcholine efflux. Last, Dr. Sakimoto presents EEG activity during configural discrimination task in rat. He shows power spectrum analysis with hippocamopal theta. After each presentation, we will discuss with each other and with many attenders.

**1**
**Title**: Major histocompatibility complex class I molecules regulate asymmetry in hippocampal circuitry
**Author**: Isao Ito
**Affiliation**: Kyushu University, Japan
**Corresponding author email**: isitoscb@kyushu-u.org
**Abstract**: Left-right (L-R) asymmetry is a fundamental feature of higher-order brain function, whereas the molecular basis of brain asymmetry has remained unclear. We have recently shown asymmetries in the circuitry of the mouse hippocampus resulting from the asymmetrical allocation of NMDA receptor (NMDAR) subunit GluRε2 (NR2B). This asymmetrical allocation of ε2 subunits affects the properties of NMDARs and generates two populations of synapses, 'ε2-dominant' and 'ε2-nondominant' synapses, localized asymmetrically in the hippocampal circuitry. For the generation of this asymmetrical circuitry, a specific recognition process between presynaptic terminals and postsynaptic spines appears to be essential. We hypothesized that major histocompatibility complex class I (MHCI) might be a component in this specific recognition process and required for the generation of hippocampal asymmetry. Accumulating evidence indicates that MHCI proteins are expressed in the brain and are required for activity-dependent refinement of neuronal connections and normal synaptic plasticity. To test our hypothesis directly, we analyzed hippocampal circuitry of β2-microglobulin (β2m)-deficient mice lacking stable cell surface expression of MHCI. We conducted biochemical, electrophysiological and morphological analyses for the β2m-deficient mouse hippocampus and found that the β2m-deficient hippocampus lacks 'ε2-nondominant' synapses

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and thus contains 'ε2-dominant' synapses only, resulting in a total loss of the circuit asymmetry. Our findings provide evidence supporting a critical role of MHCI molecules for generating asymmetries in the hippocampal circuitry.

**2**
**Title**: Degu's hippocampus plays the role not only in the spatial recognition, but also in the social recognition
**Authors**: Tomoko Uekita[1,3] & Kazuo Okanoya[2,3]
**Affiliation**: [1] Doshisha University, Japan; [2] The University of Tokyo, Japan; [3] RIKEN Brain Science Institute, Japan
**Corresponding author email**: touekita@mail.doshisha.ac.jp
**Abstract**: We clarified the role of hippocampus in social behavior using a highly social rodent, Octodon degus. First we assessed the effects of hippocampus lesion (HL) on social behavior with a familiar normal partner in a familiar environment. Lesion was performed by means of multiple injection of ibotenic acid. After one-week recovery period in isolation, both of lesioned group (HPC) and sham control group (SHAM) showed increase of contact behavior in a familiar environment. However HPC showed less affinitive behavior like allo-grooming than SHAM did. Second, we examined the effects of HL on social behavior with a familiar and a novel partner in a novel environment. In a novel environment, HPC showed high frequency of contact behavior whether or not the partner is familiar. Third, we confirmed that HPC showed a normal recognition of the novel object, while the spatial recognition was impaired in the object recognition test. Taken together, these results showed that Degu's hippocampus might play the important role not only in the spatial recognition, but also in the social recognition requiring higher cognitive function.

**3**
**Title**: Hippocampal acetylcholine efflux is enhanced during negative patterning discrimination task compared with elemental discrimination task in rats
**Author**: Toshimichi Hata
**Affiliation**: Doshisha University, Japan
**Corresponding author email**: thata@mail.doshisha.ac.jp
**Abstract**: In the present experiment, we compared the amount of hippocampal acetylcholine (ACh) efflux between elemental (E) discrimination and negative patterning (NP) discrimination tasks. In the E task, rat's lever press responses were reinforced when one of two stimuli (e.g., tone) was presented, but not when the other one (e.g., light) was presented. In the NP task, responses were reinforced when either a single stimulus A (tone) or stimulus B (light) was presented, but not when the compound stimulus AB (tone + light) was presented. In the test session, the released ACh in the dorsal hippocampus was collected with the brain microdialysis technique and detected with HPLC-ECD system. After starting the session,

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the amount of ACh in the perfusate increased in both tasks and was high in the NP group compared with E group. These findings suggest that the hippocampal ACh is required in both types of discrimination, but more in the NP task.

**4**

**Title**: A comparison of hippocampal theta activity between configural and non-configural tasks

**Authors**: Yuya Sakimoto, & Shogo Sakata
**Affiliation**: Hiroshima University, Japan
**Corresponding author email**: yuya-sakimoto@hiroshima-u.ac.jp

**Abstract**: Hippocampal EEGs (electroencephalograms) were recorded from the hippocampal CA1 area or the dentate gyrus. Previous studies reported that hippocampal theta power was increased during spatial learning. However, the relationship between the hippocampal theta and a kind of the non-spatial task is still unclear. Sutherland & Rudy (1989) proposed that the hippocampus is important for solving configural tasks but not for solving non-configural tasks. Thus, we compared hippocampal theta power during configural and non-configural tasks. A total of 24 rats were assigned to either the configural task group or non-configural task group. In the configural task group, the rats were trained to perform a negative patterning task, and in the non-configural task group, the rats were trained to perform a simple discrimination task. EEGs were recorded from the hippocampal CA1 area during the performance of the tasks. The results showed that hippocampal theta power increased during non-reinforcement trials in the negative patterning task but not in the simple discrimination task. This result reveals that hippocampal EEGs reflect the differences between configural and non-configural tasks.

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## SYMPOSIUM 3
## Associative interference: Boundaries, mechanism, and commonalities to other associative phenomena

**Coordinator:** Gonzalo Miguez
**Affiliation**: SUNY – Binghamton, USA
**Coordinator's email**: gmiguez1@binghamton.edu
**Summary of the symposium:** In the associative literature, most studies and theories have focused almost exclusively in explaining reductions in acquired behavior due to either outcome interference (e.g., extinction, counterconditionig) or cue competition (e.g., blocking, overshadowing). In the present symposium we present data and theory which focus on interference between events as a determinant of behavioral change.

**Discussant:** Helena Matute
**Affiliation**: Deusto University
**Discussant's email**: matute@deusto.es

**1**
**Title**: Analogies and relations between associative cue interference and cue competition
**Authors**: Gonzalo Miguez, Lisa Mash, Mario Laborda, & Ralph R. Miller
**Affiliation**: SUNY – Binghamton, USA
**Corresponding author email**: gmiguez1@binghamton.edu
**Abstract**: Four experiments using rats in a fear conditioning task assessed analogies between the reduction in responding produced when two compounded cues are followed with a common outcome (i.e., cue competition) relative to when the cues are reinforced in separate phases (i.e., associative cue interference). Experiment 1 found that after inducing retroactive cue interference, extinction of the interfering cue (i.e., the nontarget cue) decreases interference, as has been observed in retrospective reevaluation experiments in cue competition. In line with the previous finding, by varying the number of reinforced training trials with the interfering cue, Experiment 2 determined that the amount of interference observed at test depends on the associative status of the interfering cue. Using forward-blocking in Experiment 3 and backward-blocking in Experiment 4, we assessed whether these putative two cue competition phenomena can be caused, due to the nature of blocking designs, not only by cue competition mechanisms but also by proactive or retroactive interference (i.e., a decrease in responding without a concurrent presentation of the two cues), respectively. Specifically, we found that renewal of forward blocking parallels the renewal of proactive cue interference, while renewal of backward blocking parallels that of retroactive cue interference.

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**2**

**Title**: Boundary conditions for interference between cues in human contingency learning

**Authors**: David Luque, Joaquín Morís, Pedro L. Cobos, & Francisco J. López
**Affiliation**: University of Málaga
**Corresponding author email**: david.luque@gmail.com

**Abstract**: Despite its apparent simplicity, the interference between cues effect continues defying a complete and sound explanation. To start with, one relevant issue is whether the effect itself may be consistently found in human contingency learning. This talk shows some data regarding three relevant factors that determine if this effect is observed. Firstly, the causal scenario in which the experimental task is framed. Secondly, the temporal delay after training but before the test phase takes place. Thirdly, the number of response options that are used as potential outcomes associated to the cues. These three different factors have to be taken into account in those models that may try to explain interference between cues, and the theoretical implications derived will be discussed.

**3**

**Title**: The role of inhibition in interference between cues and between outcomes: Inhibitory associations or inhibited representations?

**Authors**: Miguel A. Vadillo[1], Nerea Ortega-Castro[1], Cristina Orgaz[2], David Luque[3], Pedro L. Cobos[3], Francisco J. López[3] & Helena Matute[1]
**Affiliation**: [1] University of Deusto, Spain; [2] National University of Distance Education, Spain; [3] University of Málaga, Spain
**Corresponding author email**: mvadillo@deusto.es

**Abstract**: During the last years, several attempts have been made to develop an integrative account for interference between cues and interference between outcomes. Given that both types of interference are sensitive to contextual manipulations and to retention intervals, it is likely that both types of interference share common mechanisms. A potential explanation is that both of them might involve the kind of context-dependent inhibitory associations described by Bouton's retrieval theory. However, recent research on retrieval-induced forgetting (RIF) suggests an alternative interpretation of these effects. According to this framework, one of the mechanisms that allow people to deal with conflicting information is to inhibit the representation of information that is easily accessible but irrelevant for a given task. Interestingly, the experimental paradigm used to study RIF is very similar to an interference paradigm. Our experiments suggest that the kind of inhibition assumed to play a role in RIF is likely to be involved in interference between outcomes and interference between cues.

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**4**

**Title**: Associative mechanisms during conditioned inhibition training revealed in high-schizotypy individuals

**Author**: Irina Baetu

**Affiliation**: University of Adelaide, Australia

**Corresponding author email**: irina.baetu@adelaide.edu.au

**Abstract**: With few training trials, a sensory preconditioning procedure (X-A, A-Unconditioned Stimulus; US) typically endows the target cue (X) with excitatory properties; however, extended training can result in X acquiring some inhibition. This transition from excitation to inhibition during training might be explained by an auto-associator (McClelland & Rumelhart, 1988), a connectionist model that learns both Cue-US associations and within-compound associations. The model predicts that excitatory X-A and A-US excitatory associations form first, and this excitatory chain of associations (X-A-US) interferes with the developing inhibitory X-US association, particularly early in training (Baetu & Baker, 2009). Although this effect has been demonstrated in animal conditioning experiments (Stout, Escobar & Miller, 2004; Yin, Barnet & Miller, 1994), there are no such demonstrations in the human contingency learning literature. This transition from excitation to inhibition during conditioned inhibition training was studied in a human contingency learning task. Although the effect was not detected at the group level (X became inhibitory early in training), it was detected in a sub-group of individuals who reported schizotypal (schizophrenic-like) symptoms. I will discuss implications for associative models and theories of schizophrenia.

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## SYMPOSIUM 4
## Flavour learning

**Coordinator:** Robert Boakes
**Affiliation**: University of Sydney, Australia
**Coordinator's email**: bob.boakes@sydney.edu.au
**Summary of the symposium:** Flavours acquire hedonic value in a variety of ways. Animals can come to prefer a flavour because of the nutritional consequences that follow, as examined by Myers. Animals' flavour preferences are also influenced by maternal diet and social interactions, as examined by Figueroa. A debate continues over the extent to which flavour learning displays the same properties as better-known forms of associative learning. This question is addressed in relation to flavour-nutrient learning by González and in relation to flavour aversion learning by Honey, Burgess and Dwyer.

**Discussant:** Geoffrey Hall
**Affiliation**: University of York, UK and University of New South Wales, Australia
**Discussant's email**: g.hall@unsw.edu.au

**1**
**Title**: When is postingestive reward detected? Both rapid and delayed postingestive effects of nutrients contribute to learned flavor preference.
**Author**: Kevin P. Myers
**Affiliation**: Bucknell University, USA
**Corresponding author email**: kmyers@bucknell.edu
**Abstract**: It is well established that animals learn to associate the oral-sensory properties of foods with nutritional consequences that follow. Such Pavlovian associations between flavors (CS) and postingestive rewarding effects of nutrition (US) enhance the liking and preference for those flavors. Yet the exact physiological basis for the postingestive US is still undetermined. We have undertaken a line of experiments aimed at characterizing the US by studying when during or after a meal it is detected. These experiments involve training rats with multiple distinct flavors, with each always occurring either early or late in a meal, and determining which flavors become most strongly associated with the meals' postingestive effects. Using both glucose and fat as the nutrient source, we have found evidence for two distinct reward mechanisms, one with rapid onset (within the first several minutes of meal initiation) and another with slower onset. Moreover we have found that the rapid-onset reward mechanism may be sensory-specific, to make animals resistant to switching flavors when they detect nutrition. These parallel learning mechanisms may help explain particular features of human appetite (such as enhanced liking for 'dessert' foods and state-dependent effects on preference for entrée vs

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dessert foods.) But these findings also point to a possible novel attentional/motivational mechanism that may contribute to adaptive foraging in animals.

**2**
**Title**: Pigs' flavour preferences conditioned by the effects of prenatal environment, nutrients and social interactions.
**Author**: Jaime Figueroa
**Affiliation**: Autonomous University of Barcelona, Spain
**Corresponding author email**: figuejaime@gmail.com
**Abstract**: Pigs have a strongly developed oro-nasal sensory system which enable them to detect volatile compounds in their environment and which is used to recognize and prefer feeds cues previously learned as a result of positive experiences. We proposed that pigs, like other mammals, may learn to prefer a flavour cue from their mother from trial and error tasks or from social interactions with conspecifics and that this learning could create long lasting flavour preferences that may improve intake of new diets. We performed trials where pigs were exposed to different flavour learning conditions: 1. during late gestation through maternal diet; 2. classical conditioning using the positive effect of proteins, or 3. social learning promoted by brief contact with conspecific animals that previously ate a flavoured feed. In all 3 cases pigs showed a highly and long-lasting preference for the flavours. Associative learning of flavour cues in pig production could be a useful strategy for stimulating food intake and reducing negative impacts on pig production during weaning.

**3**
**Title**: CS-exposure effect in simultaneous flavour-nutrient conditioning: extinction and latent inhibition
**Authors**: Felisa González[1], David García-Burgos[1], & Geoffrey Hall[2]
**Affiliation**: [1]University of Granada, Spain, [2]University of York, UK
**Corresponding author email**: fgreyes@ugr.es
**Abstract**: Repeatedly exposing hungry rats to a flavour after this has been paired simultaneously with a nutrient produces a decrease in preference when assessed in a 2-bottle flavour vs. water test; however, the preference remains if rats are tested thirsty (e.g., Harris et al., 2004). In a series of experiments we considered whether this decrease might be due to extinction of the conditioned preference or to acquisition by the flavour of net inhibitory properties. Extinction-related phenomena, such as spontaneous recovery and reinstatement, were not found; the US-devaluation effect was also absent. However, the CS passed both summation and retardation tests for conditioned inhibition. This pattern of results is consistent with the proposal that during post-training CS-exposure, rather than extinction of the conditioned preference, a segregated representation of the CS might be formed via a perceptual differentiation process. In a second set of experiments we studied the role of hunger on latent inhibition and found

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that the effect was observed when animals were tested hungry and thirsty but not when tested just thirsty. This outcome was independent of motivational state during training (pre-exposure and conditioning). Together these results suggest that flavour-taste and flavour-nutrient learning might be differentially affected by CS exposure.

**4**

**Title**: Understanding the nature of sensory preconditioning through an analysis of licking

**Authors**: Robert C. Honey, Katy V. Burgess, & Dominic M. Dwyer
**Affiliation**: Cardiff University, UK
**Corresponding author email**: honey@cardiff.ac.uk

**Abstract**: After two neutral stimuli have been paired (AB), directly conditioning a response to one of them (A) will also be reflected in a change in responding to the other (B). Standard accounts of this sensory preconditioning effect assume that it is mediated by a memory involving the stimulus that was directly conditioned (i.e., A). The reliance on this shared pathway implies that sensory preconditioning (involving B) and direct conditioning (involving A) should support qualitatively similar patterns of responding. In four experiments, directly pairing A with LiCl delivery resulted in both a reduction in consumption of A (i.e., avoidance) and a reduction in the size of licking clusters it elicits (i.e., aversion). In contrast, the sensory preconditioning effect resulted in a reduction in the consumption of B but not in the nature of the licking response that it elicited; and a similar dissociation was observed after trace conditioning. These dissociations involving direct conditioning and sensory preconditioning, observed over a range of flavor concentrations and different doses of LiCl, undermines standard accounts of sensory preconditioning that are based on the assumption of stimulus substitution.

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## SYMPOSIUM 5
## Taste memory and taste aversion learning

**Coordinator:** Robert Boakes
**Affiliation**: University of Sydney, Australia
**Coordinator's email**: bob.boakes@sydney.edu.au
**Summary of the symposium:** Memory for a taste can be studied by exploiting the fact that animals generally display neophobia towards a novel taste and that with repeated exposure the aversion habituates to the extent that the animal remembers the taste. The role of context in retrieving such memories is the focus of Talk 1, while the brain circuitry involved in taste memory is the focus of Talk 2. Memory of a taste can be studied by exploiting the fact that animals generally display neophobia towards a novel taste and that with repeated exposure the aversion habituates to the extent that the animal remembers the taste. The role of context in retrieving such memories is the focus of Talk 1, while the brain circuitry involved in taste memory is the focus of Talk 2. Memory for a taste is subject to interference from later events and this is the focus of Talk 3; this reports experiments on taste aversion learning involving sizeable delays between the taste and subsequent lithium injection. The importance of distinguishing between taste avoidance and conditioned disgust is reinforced by the experiments reported in Talk 4 on the effects of pre-exposure to either the target taste or to lithium.

**Discussant:** Ignacio Loy
**Affiliation**: University of Oviedo, Spain
**Discussant's email**: nacholoy@gmail.com

**1**
**Title**: Effects of context on flavour memory
**Authors**: L. G. De la Casa, E. Díaz, A. Fernández, A. Mena, & A. Orgaz
**Affiliation**: University of Seville, Spain
**Corresponding author email**: delacasa@us.es
**Abstract**: The role of context in the retrieval of learned information has been widely analyzed in the associative learning domain. However, the evidence on the effect of context on flavor memory retrieval is more limited and seems to be more related to non-associative factors such as the context novelty or familiarity. We have carried out a detailed analysis of possible interactions between habituation and recovery of neophobia and the context in which the flavors are presented by manipulating variables such as flavor intensity, type of flavor, prior experience with the context, or the effect of dopaminergic drugs. The results point to the relevance of context familiarity in the stability of taste neophobia habituation, and indicate that the use of the home cage as experimental context promotes the recovery of the taste memory and seems to add an additional component that facilitates the retrieval of taste memory as a safe stimulus.

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**2**
**Title**: Safe taste memory as a model for the study of recognition memory brain systems
**Authors**: Gómez-Chacón, B., Morillas-González, E., Gámiz, F., & Gallo, M.
**Affiliation**: University of Granada, Spain
**Corresponding author email**: mgallo@ugr.es
**Abstract**: Taste neophobia defined as the reluctance to consume unfamiliar tastes and its habituation is a good model of taste recognition memory in rats. While visual recognition memory has been proposed to be dependent on medial temporal lobe areas, previous lesion and inactivation studies have found several brain areas required for safe taste recognition memory, such as the insular cortex, accumbens nucleus, hippocampus, basolateral amygdala and perirhinal cortex. We have applied an approach that combines lesion and inmunohistochemical identification of immediate early genes as neuronal activity markers in order to delineate interdependent components of the neural circuit involved in safe taste memory. The results have shown that taste familiarity increased activity of the medial portion of the perirhinal cortex and the parvocellular thalamic taste relay area (VPMpc). This activity depends on the basolateral amygdala integrity. Therefore, our results point to the perirhinal cortex as a component of the neural circuit required for safe taste memory. This is in accordance with an involvement of the area in other types of recognition memory, such as visual recognition memory. However, anatomical dissociation among shared and independent components of the temporal lobe and subcortical areas required for various types of recognition memory require further study.

**3**
**Title**: Serial overshadowing in long delay taste aversion learning
**Authors**: Kwok, D., & Boakes, R.A
**Affiliation**: University of Sydney, Australia
**Corresponding author email**: bob.boakes@sydney.edu.au.
**Abstract**: Animals can learn to associate a taste with a nausea-inducing event that takes places some time later to the extent that there are few events to interfere with such learning (Revusky, 1971). Events can interfere with acquisition of a taste aversion whether they occur before the taste (proactive interference) or in the interval between the taste and the nausea (retroactive interference). We report a series of experiments that examine the extent that context and other tastes can produce retroactive interference with conditioning of an aversion to a sucrose solution that provides the target taste. The results indicate that two kinds of serial overshadowing can be involved. When an interfering taste (saline) closely follows the target taste, this produces 1-trial overshadowing and thus suggests that memory of the sucrose has been degraded by the saline. When, after exposure to the target taste, rats are introduced to a novel context, we have failed to detect any overshadowing after a single conditioning trial, but obtain strong overshadowing after two conditioning trials. The latter result is consistent with the analysis of overshadowing provided by the Rescorla-Wagner (1972) model.

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**4**

**Title**: Pre-exposure effects and hedonic reactions in taste aversion learning

**Authors**: López, M., Gasalla, P., & Soto, A.
**Affiliation**: University of Oviedo, Spain
**Corresponding author email**: mlopez@uniovi.es

**Abstract**: In three experiments we examined rats´ hedonic responses during conditioning of lithium chloride (LiCl)-based taste aversions following pre-exposure to either the target taste or to lithium. In Experiments 1 and 2 non-reinforced exposure to saccharin prior to a saccharin-LiCl pairing resulted in attenuated conditioned taste avoidance, as assessed by a consumption test. In contrast, the pre-exposure treatment did not attenuate the conditioned disgust reactions elicited by the saccharin solution when intraorally infused into a rat´s oral cavity. Furthermore, the administration of the anti-nausea agent, ondansetron, on the day of conditioning in Experiment 2 did not affect saccharin consumption but interfered with the production of disgust reactions to the solution in the taste reactivity test. Experiment 3 examined the effect of giving exposure to LiCl prior to conditioning. The results showed that pre-exposure to LiCl attenuated the magnitude of the conditioned aversion when assessed by both the consumption and the taste reactivity tests. The attenuating effect of LiCl-pre-exposure was not observed, however, when the rats were given intraoral water infusions during the pre-exposure phase. The results are discussed in terms of a dissociation between taste avoidance and conditioned disgust in taste aversion learning.

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## SYMPOSIUM 6
## Some Comparative Psychology: Honoring Jeff Bitterman

**Coordinator and Discussant:** Mauricio R. Papini
**Affiliation**: Texas Christian University, USA
**Coordinator's/Discussant's email**: m.papini@tcu.edu
**Summary of the symposium:** M. E. Bitterman, called "Jeff" for as long as he could remember, was born on January 19, 1921, in Brooklyn, New York, and died on May 10, 2011, in San Francisco, Calilfornia. It was research with T. C. Schneirla at the American Museum of Natural History led Jeff to pursue a career in comparative psychology at Columbia University, where he received a Master's Degree with C. J. Warden, and later at Cornell University, where he received a PhD under H. S. Liddell, in 1945. Jeff had a long and distinguished career, spanning from 1943 to 2008 and producing over 300 publications. He was distinguished with the Humboldt Prize, the H. C. Warren Medal from the Society of Experimental Psychologists, the E. R. Hilgard Lifetime Achievement Award, and the D. O. Hebb Distinguished Scientific Award. His careful analysis of learning processes in mammals, fish, and honeybees stand as a pinnacle of 20th Century Science. In this symposium, four speakers will honor Bitterman's legacy by describing their respective research on animal learning and making connection with his approach, ideas, and contributions.

**1**
**Title**: Beyond classical conditioning in honeybees
**Author**: Randolf Menzel
**Affiliation**: Freie Universität Berlin, Germany
**Corresponding author email**: menzel@neurobiologie.fu-berlin.de
**Abstract**: Jeff Bitterman taught me experimental psychology in the early 1980s. He also was highly influential in bringing experimental psychology to Germany at a time when little attention was paid to learning psychology in the tradition of behaviorism. At this time, studies on learning in insects, particularly Drosophila and the honeybee attracted students from ethology and biological cybernetics. His knowledge and advice was therefore highly welcome. However, collaboration with Jeff Bitterman was not always easy. In addition, the cognitive turn in psychology and neuroscience was not welcome and supported by Jeff Bitterman, and his opinion about the ethological tradition (particularly in Germany) made discussions with him difficult. I shall describe my own ways from ethology and sensory physiology (in the tradition of Karl von Frisch) to experimental designs in the tradition of experimental learning psychology (under the influence of Jeff Bitterman) to a cognitive approach. The examples will come from laboratory and field studies in honeybees.

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**2**
**Title**: Learning and evolution of cognition in amphibians
**Author**: Rubén Muzio
**Affiliation**: University of Buenos Aires & IBYME-CONICET, Argentina
**Corresponding author email**: rnmuzio@gmail.com
**Abstract**: M. E. Bitterman's paper "The comparative analysis of learning" (Science, 1975) introduced a new approach to the study of the patterns and processes in the evolution of learning. My interest in the learning and evolution of cognition in amphibians stems from his comparative analysis perspective. The brain of phylogenetically ancient vertebrates (e.g., fish and amphibians) shows no neocortex, having a simpler organization than that observed in mammals. Thus, these unconventional models offer a unique possibility to study basic mechanisms of a wide variety of behaviors without a strong cortical modulation. I will discuss three specific procedures used with amphibians (runway, spatial learning, and aversive conditioning) that were developed in my laboratory to study different aspects of learning, both appetitive and aversive, and their neural basis. The study of amphibian models is starting to give clues about the basic mechanisms underlying learned behavior, which are often highly conserved across evolution.

**3**
**Title**: A functional-evolutionary approach to behavioral excess
**Author**: Ricardo Pellón
**Affiliation**: National University of Distance Education, Spain
**Corresponding author email**: rpellon@psi.uned.es
**Abstract**: Adjunctive behavior is a model of excessive behavior and as such it has been evaluated on circumstances generating repetitive (compulsive) or premature (impulsive) behaviors that might underline diseases such as drug abuse, anorexia or attention deficit hyperactivity disorder. We have theorized that adjunctive behavior is maintained by delayed positive reinforcement, assuming that the temporal window by which reinforcers are effective might depend on the type of behavior as it is relevant to the programmed reinforcer. In this talk I will present data on excessive drinking by laboratory rats that seem to conform to this theory. Such evolutionary-functional approach might help understand the health problems modeled by the laboratory animal model, in line with the comparative approach that was best exemplified by the work of Jeff Bitterman.

**4**
**Title**: Is the study of sexual differences comparative in nature?
**Author**: Germán Gutiérrez
**Affiliation**: Universidad Nacional, Colombia
**Corresponding author email**: gagutierrezd@gmail.com
**Abstract**: Comparative psychology studies behavioral differences and similarities in adaptation among species. M. E. Bitterman argued for the

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study of general laws of learning through a systematic comparative approach. Although he mostly applied this view to inter-specific comparisons of learning, his view is consistent with applying the comparative strategy to study intra-specific differences in behavior, such as male-female differences in learning and behavior. Studies of sex differences in learning using animal models are often inconclusive. I argue that male-female comparisons may contribute to the understanding of the evolution of behavior. Using a Pavlovian paradigm, we compared the conditioned responses of male and female quail to the presentation of a conditioned stimulus (CS) followed by access to a copulation partner. Whereas males approach the CS, females do not approach the CS, but they increase receptive responses. Females also show proceptive responses, when given an opportunity to approach areas where males have been presented. These findings are explained in terms of sexual selection theory and provide clear evidence of sexual learning both in male and female quail. Comparisons between males and females are important to understand the evolution of behavior both within and across species.

**5**
**Title**: Bitterman's quantitative approach to learning theory
**Author**: Pat A. Couvillon
**Affiliation**: University of Hawaii at Manoa, USA
**Corresponding author email**: pat@pbrc.hawaii.edu
**Abstract**: Quantitative theory development has played a significant role in the study of animal learning for decades. Jeff Bitterman often wondered aloud what might have been achieved by one of psychology's great early theoreticians, Clark Hull, if he had had access to computers. In the 1970s, Bitterman, along with William Woodard, began simulating the habit reversal performance of pigeons and goldfish to determine if temporal decay of inhibition was required to fit the different patterns of responding of the two species in similar problems. In the 1980s, Bitterman, along with P. A. Couvillon, began to develop a quantifiable theory of choice discrimination learning in honeybees. Their work with honeybees had produced data on habit reversal, probability matching, ambiguous cue, compound-component, and conditional problems that extended to symbolic matching-to-sample. Data were collected under highly standardized conditions, making it possible to run trial-by-trial simulations to find a single set of parameters fitting the entire set of experiments. Not only could the model account for the existing data, but it produced testable predictions that challenged the theory and guided empirically-based modifications. I will review the Bitterman-Woodard-Couvillon computational approaches to learning theory and describe Bitterman's views of what is required to move forward.

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## SYMPOSIUM 7
## What is working memory in nonverbal animals?

**Coordinator and Discussant:** Robert Hampton,
**Affiliation**: Emory University and Yerkes National Primate Research Center, USA
**Coordinator's/Discussant's email**: robert.hampton@emory.edu
**Summary of the symposium:** Working memory is often defined in very different ways, some that emphasize attention and cognitive control, others focused on specific neural substrates, some emphasize duration or capacity, and yet others focus on the relevance of information to the completion of a specific task. Matching-to-sample tests are often construed as measuring working memory in nonhuman animals, yet the correspondence to the criteria listed above is hardly clear, and a variety of results indicate that accuracy in matching-to-sample tests is determined by multiple memory processes. This symposium is organized to stimulate a discussion among individuals with different perspectives on working memory and to encourage identification of convergences and differences in the memory processes studied from these perspectives. Our goal is to better discriminate among memory processes, not necessarily to develop a unified notion of working memory.

**1**
**Title**: Holding familiar information in working memory is cognitively effortful for monkeys
**Authors**: Benjamin M. Basile, & Robert R. Hampton
**Affiliation:** Emory University and Yerkes National Primate Research Center, USA
**Corresponding author email**: bbasile@emory.edu
**Abstract**: Imagine a colleague tells you their phone number and then another asks you an unrelated question. This competition for your limited attention will likely make you forget the number. Information in human working memory is usually lost within seconds unless actively maintained. The ability to exert cognitive control over working memory is a central component of most human memory models, is likely a major factor in general intelligence, and may account for many cognitive differences between humans and nonhumans. Despite the importance of cognitive control of memory in human cognition, behavioral evidence of it in nonhuman primates is absent and neurophysiological evidence is indirect. Too often it is uncritically assumed. Here, we show that monkeys' memory for familiar images is under active cognitive control. Competing cognitive demands impaired recognition in a demand-dependent manner, indicating that working memory in monkeys requires a limited resource that is divided among ongoing tasks. Strikingly, recognition for equally difficult to remember unfamiliar images was unaffected, demonstrating a dissociation in memory processes within the same memory test. Familiar images are maintained in working memory by an active, cognitively-demanding process, whereas unfamiliar images are recognized using passive, effortless familiarity.

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**2**
**Title**: The Misinterpretation of Retention Functions in Delayed Matching to Sample
**Author**: Thomas Zentall
**Affiliation**: University of Kentucky, USA
**Corresponding author email**: zentall@uky.edu
**Abstract**: After training animals on matching-to-sample, one can assess their working memory for the sample by inserting a delay between the offset of the sample and the onset of the comparison stimuli. But the novelty of the delays may introduce artifacts that can distort the retention functions obtained. For example, when samples consist of a temporal discrimination (a single stimulus presented for a short or longer time), the similarity of the delays to the intertrial interval may result in what appears to be the subjective shortening of the duration of the sample (forgetting of the long sample but not the short sample). Similarly, when samples consist of the presence versus the absence of a stimulus, pigeons may peck at the stimulus but not at its absence. If so, the absence of pecking during the delay may result in a bias to choose the comparison associated with the absent sample. We have found that if original training is conducted with delays, a more accurate set of retention functions can be obtained. However, the mere introduction of delays may result in reduced attention to the sample, as suggested by the decrement in matching accuracy on trials without a delay, when delays are introduced.

**3**
**Title**: Memory in the "real" world: a useful avenue for characterising working memory?
**Author**: Susan D. Healy
**Affiliation**: University of St Andrews, UK
**Corresponding author email**: sdh11@st-andrews.ac.uk
**Abstract**: Definitions of working memory vary with the research question being addressed. Here I will use data from a number of different tests of memory in wild, free-living animals in the field and in animals performing spatial navigation tests in the laboratory, in an attempt to characterise the relevant components of memory that can be defined and quantified. The aim is to enable more useful comparisons with data from other species, including humans, and from other tests, including standard matching-to-sample.

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# TALKS

## TALK SESSION 1A
## Neurobiological approaches to learning and memory

**1**

**Title**: Cambios en la expresión c-Fos cerebral tras la extinción de la memoria espacial.

**Authors**: Méndez-Couz M., Conejo N.M., Fidalgo C., Vallejo G., & Arias JL.
**Affiliation**: University of Oviedo, Spain.
**Corresponding author email**: mendezmarta.uo@uniovi.es

**Abstract**: Aunque existe un acuerdo generalizado de las estructuras cerebrales subyacentes a la adquisición de la memoria espacial, poco se conoce acerca de los cambios que ocurren durante el proceso de extinción de la misma. En este estudio se evalúa la contribución funcional de diversas regiones cerebrales tras la extinción de un aprendizaje espacial previamente adquirido empleando el laberinto acuático de Morris. Para ello usamos ratas macho adultas entrenadas en una tarea de memoria de referencia espacial. Cambios asociados a la extinción fueron estudiados empleando la técnica inmunocitoquímica de la proteína c-Fos para determinar la participación de estructuras cerebrales corticales y subcorticales. Se incluyó un grupo control de animales para controlar factores ligados al estrés o la actividad locomotora. Los resultados muestran que la retirada de la plataforma indujo la extinción de la conducta espacial previamente adquirida, sin existir recuperación espontánea de la misma tras su evaluación 24 h después. La extinción se relacionó con un incremento significativo generalizado de la actividad c-Fos en los núcleos amigdalinos del grupo experimental. Curiosamente, el mamilar lateral presentó mayor actividad c-Fos en el grupo control. Estos resultados proporcionan nuevas perspectivas sobre el papel de estructuras subcorticales en la extinción de la memoria espacial.

**Title**: Changes in brain c-Fos expression following spatial memory extinction

**Abstract**: Although there is general agreement the particular brain regions underlying spatial learning, little is known about the changes that take place during the extinction process. This study aimed to evaluate the functional contribution of selected brain regions during the extinction of a previously acquired spatial memory task in the Morris water maze. For that purpose, we used adult male Wistar rats (Rattus norvegicus) trained in a spatial refence memory task and learning-related changes in c-Fos IR cells were evaluated in cortical and subcortical regions after training. Control groups were included

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to account for factors like stress or locomotor activity not directly related with learning. Results show that removal of the hidden platform in the water maze induced extinction of the previously reinforced escape behavior after 16 trials, without spontaneous recovery 24 h later. Extinction was related with significantly higher c-Fos positive nuclei in amygdala nuclei. However, the lateral mammilary bodies showed higher c-Fos IR cells than the control group. These findings provide new insights about the role of subcortical brain regions in spatial memory extinction. This work was supported by grant PSI2010-19348 (Spanish Ministry of Education and Science and Innovation and European Regional Development Fund)

**2**

**Title**: Involvement of striatal dorsolateral in automatic control processes.
**Authors**: Quintero, E., Mena, A., Barroso, A., Vargas, J.P, Díaz, E., & López, J.C.
**Affiliation**: University of Sevilla, Spain
**Corresponding author email**: jclopez@us.es
**Abstract**: We have previously shown that when a latent inhibition procedure is established with a prolonged pre-exposure phase, inactivation of the dorsolateral striatum during the test phase produces a decrease of the interference effect of the preexposure learning over the conditioning learning. One possible explanation for this effect is that this structure is involved in the learning control of the pre-exposure phase under conditions which favor the automation of this learning process. The purpose of the present experiment is to analyze the role of the dorsolateral striatum in the automatic process of the pre-exposure learning. With this aim the dorsolateral area of the striatum of a group of rats was lesioned before the start of the experimental phase. Later, these animals were trained using a long pre-exposure phase. If the dorsolateral striatum acquires the control of the preexposure learning only in advanced stages of processing, then the results would show an attenuated effect of latent inhibition in the lesioned group compared to control group. This study was supported by PSI2009-12761.

**3**

**Title**: Novel evidence for a role of the bed nucleus of the stria terminalis in the expression of contextual anxiety in rats
**Authors**: Laura Luyten, Deb Vansteenwegen, Kris Van Kuyck, Cindy Casteels, Michel Koole, Koen Van Laere, & Bart Nuttin
**Affiliation**: KU Leuven, Belgium
Corresponding author email: laura.luyten@ppw.kuleuven.be
**Abstract**: Animal models of psychiatric disorders are important translational tools. For instance, expression of contextual anxiety in a previously shocked context is a widely used model of (pathological) anxiety (Luyten et al. (2011) Cogn Affect Behav Neurosci). Rat fear conditioning is typically indexed using freezing or startle amplitude. In our experiments, we com-

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bine both measures for a more complete assessment of anxious behavior (Luyten et al. (2011) J Neurosci Methods). Using 18F-fluorodeoxyglucose micro-positron emission tomography (FDG-PET) imaging, we investigated the neurocircuitry of contextual anxiety in awake, conditioned rats. Our main finding was hypermetabolism in a cluster comprising the bed nucleus of the stria terminalis (BST) in rats expressing contextual anxiety compared to rats expressing cued fear and controls (Luyten et al. (2012) J Neurosci). In a subsequent study, we found that post-training bilateral electrolytic lesions in the BST completely disrupted freezing and startle potentiation in a conditioned context (Luyten et al. (2011) Behav Brain Res). Taken together, these findings provide novel evidence for a role of the BST in the expression of contextual anxiety.

**4**
**Title**: The prefrontal cortex, attention, and memory for the location of events.
**Authors**: Andrew Talk, Rebecca Parnell, & Katrina Grasby
**Affiliation**: University of New England, Australia
**Corresponding author email**: atalk@une.edu.au
**Abstract**: Humans with frontal cortical damage are deficient in cue-elicited attention and in source memory tasks. However, directing such subjects to specifically attend to the surrounding contexts of cues during encoding can enhance performance of later recollection, suggesting a role for the frontal cortex during source memory encoding. We directly confirmed this in rats by inactivating the medial prefrontal cortex with muscimol during the encoding phase or test phase of a spatial sensory preconditioning procedure. Rats experienced sensory cues as they explored an open platform, and then were later tested on recollection of the prior location of the cue. Suppression of activity in the frontal cortex during the encoding phase blocked memory about the location of the cues but suppression during test had no effect on memory retrieval. Moreover, animals with suppressed frontal cortical activity in the encoding phase expressed smaller cue-directed orienting responses, indicating they attended less to the cue. These results indicate that the frontal cortex may be required to direct attention to incidental cues in order to later recollect the location in which they have been experienced, but that once the location information is encoded the frontal cortex is not required for retrieval of that information.

**5**
**Title**: Behavioral effects of dopaminergic agents on schedule-induced drinking in the Spontaneously Hypertensive Rat, Wistar Kyoto rats and normal Wistar rats
**Authors**: Javier Íbias, & Ricardo Pellón
**Affiliation**: National University of Distance Education, Spain
**Corresponding author email**: j.ibias@madrid.uned.es

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**Abstract**: The acquisition of schedule-induced drinking was investigated in 24 male rats of three different strains [8 SHR (Spontaneously Hypertensive), 8 WKY (Wistar Kyoto) and 8 Wistar rats] using a multiple fixed time (FT) food schedule with two separate components, FT 30 and FT 90 seconds. After 40 sessions of acquisition which guaranteed a stable level of drinking for each individual rat, the effects of selective and non-selective dopamine agents were evaluated. Levels of adjunctive drinking were much higher under FT 30-s than FT 90-s components, with SHR rats showing faster learning and/or more elevated asymptotic drinking. WKY and Wistar rats took longer but finally matched the level of SHR rats in the FT 30-s component, but never did so in the FT 90-s component. Distinct dose-response functions resulted for the different strains of rats, being these in relation to an existing dopamine hyperfunction in SHR rats and to their elevated hyperactivity and impulsivity.

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## TALK SESSION 1B
## Social Behavior

**1**
**Title**: Vertebrate Predators May Share Facial Characteristics Providing Opportunities for Detection by Prey
**Authors**: Jesse E. Purdy[1], & Kelly Finn[2]
**Affiliation**: [1]Southwestern University, USA; [2]Animal Kingdom, Disney World, Florida USA
**Corresponding author email**: purdy@southwestern.edu
**Abstract**: A direct gaze from a predator can cause or prolong defensive behavior (Hampton, 1994; Hennig, 1977). Such findings suggest that prey animals might identify a predator based on facial characteristics. If they do, the possibility exists that such characteristics generalize across predators. To test this idea we created an "average predator." Sixty-four pictures of vertebrate predators were obtained from Dreamstime www.dreamstime.com). Four initial predators were created (mammal, reptile, fish, & bird) in which sixteen pictures were morphed together using Creaceed's Morph Age Pro 4.0.7. These pictures were then morphed into the "average predator." The most salient features of the "average predator" offered insight into the facial characteristics that might serve as recognition cues for prey. The eyes and mouth were most salient across morphs, coinciding with Gallup et al's (1971) findings that the eyes of a predator were most significant in eliciting and prolonging a fear response in chickens. In addition, a wide face, wide jaw line, and short protruding muzzle region appeared consistent across morphs, concurrent with Karplus and Algom (1981)'s analysis of predator features. Currently we are testing whether the "average predator" elicits anti-predatory behavior in hermit crabs. Preliminary results are consistent with this hypothesis.

**2**
**Title**: Applied Behavioral Management of Captive Nonhuman Primates
**Authors**: Steven J. Schapiro, & Susan P. Lambeth
**Affiliation**: The University of Texas, USA
**Corresponding author email**: sschapir@mdanderson.org
**Abstract**: For almost 25 years, our group has been providing captive nonhuman primates with a variety of 'enrichment' opportunities specifically designed to both challenge the animals and to create situations in which they can express important species-typical behaviors. This includes the use of operant conditioning techniques, specifically, positive reinforcement training techniques that allow the nonhuman primates to voluntarily participate in a number of activities that are essential for their care and management. In addition, our animals participate as subjects in a wide variety of basic behavioral science investigations focusing on questions related to laterality, prosociality, cultural transmission, and behavioral

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economics. Many of our behavioral study procedures have proven to be stimulating, challenging, and enriching for the animals. Similarly, most of our training procedures, in addition to facilitating necessary behaviors, provide the animals with numerous chances to exhibit control and choice. I will describe a number of our more recent and novel enrichment, training, and study techniques, and will demonstrate how these practices help refine our management procedures, provide the animals with opportunities to make meaningful choices, and enhance the lives of the nonhuman primates living at our facility.

**3**

**Title:** Social aspects of acquisition and transmission of illusion of control
**Authors:** Marcelo Benvenuti, Flávia Meneses-duarte, & Saulo Missiaggia-Velasco
**Affiliation:** University of São Paulo, Brazil
**Corresponding author email:** mvenbenuti@yahoo.com
**Abstract:** Biased expectations of personal control may depend on coincidences between actions and environmental changes that are independent of the actions. The role of these coincidences was evaluated in a situation where people could manipulate a cursor and respond in a rectangle in the center of a computer screen. Points were presented independently of the behavior of the participants. Participants' estimative of control in the situation were compared with nonverbal behavior in the task. When exposed individually to the task with little instructions, nonverbal performances of the participants were marked by high variability in rate of responses within and across sessions. Performing consecutive sessions, participants tended to stop responding as if they were responsible for the points' presentation. In a special arrangement, a session began with a confederate participant that responded frequently. A new participant observed this session, then was exposed to independent presentations of points and finally had to instruct another participant. In this case, there was much less variability, and the participants, in successive "generations", acted as if they were responsible for point's presentation. Estimative of personal control were high for these participants. Illusion of control generated by coincidences can therefore be maximized by social variables such as observation and instruction.

**4**

**Title**: La triada *personalidad-aprendizaje de inversion-adicción*: Patrones diferenciales para el juego patológico y la adicción a la cocaína
**Authors**: Ana Torres, Alberto Megías, Andrés Catena, & José César Perales
**Affiliation**: University of Granada, Spain
**Corresponding author email**: anatorres@ugr.es
**Abstract**: En estudios anteriores hemos observado como personas con distintos tipos de adicción, y distintos grados de severidad y evolución en el desarrollo de su adicción, muestran patrones diferenciales de respuesta en la Tarea Probabilística de Aprendizaje de Inversión (PRLT). En dicha tarea

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se pide a los participantes que elijan entre una opción frecuentemente reforzada y otra mucho menos reforzada, sobre la base del feedback recibido tras su elección en cada ensayo. Una vez establecida la preferencia de respuesta, las contingencias de reforzamiento se invierten, de manera que el participante ha de reconfigurar su preferencia de respuesta. Distintos elementos de la PRLT han demostrado ser capaces de medir flexibilidad del aprendizaje y sensibilidad a la recompensa/castigo. Asimismo, factores de personalidad como la impulsividad y la sensibilidad a la recompensa y/o el castigo se han visto relacionados con la explicación de parte de la variabilidad común entre aprendizaje de inversión y adicción. En el presente estudio analizamos las relaciones entre personalidad (medida a través de pruebas psicométricas), PRLT y adicción para muestras de pacientes con problemas de adicción a la cocaína y al juego de azar.

**Title**: The *personality-reversal learning-addiction* triad: Differential patterns for cocaine abuse and pathological gambling
**Abstract**: In previous studies, we have shown that people with different types of addiction, different levels of severity, and different courses of their addictive process, also display different patterns of response in the Probabilistic Reversal Learning Task (PRLT). In this task, participants are asked to choose between a frequently rewarded option and an infrequently rewarded one, on the basis of trial-by-trial feedback. Once the behavioral preference becomes stable, reward contingencies are reversed, and the learner needs to reconfigure her previously learnt preference. Different facets of the PRLT have been proven to measure learning flexibility, and reward/punishment sensitivity. On the other hand, personality factors (as measured by psychometric tools) such as impulsivity, and reward/punishment sensitivity partially account for the shared variability between reversal learning and addiction. In the present study we analyze the relationship between personality, PRLT and addiction in samples of cocaine dependent individuals and pathological gamblers.

**5**
**Title**: La valencia emocional afecta diferencialmente a la severidad de los juicios morales
**Authors**: Luis de la Viña, David Garcia-Burgos, Antonio Cándido, & Felisa González
**Affiliation**: University of Granada, Spain
**Corresponding author email**: acandido@ugr.es
**Abstract**: Se evaluó si las emociones de distinta valencia inducidas mediante imágenes afectivas (Exp. 1a) o por ingestión de sabores (Exp. 1b) afectaban el juicio moral de situaciones simuladas. En un estudio de categorización preliminar se eligieron 10 historias, 2 de ellas recibieron un gran acuerdo (en aceptabilidad o inaceptabilidad moral extremas) y las restantes 8 de media aceptabilidad y variabilidad moral entre los participantes (mayor ambigüedad moral). Los participantes completaron un cuestiona-

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rio de juicios morales en el que se juzgaron las situaciones ficticias utilizando una escala de aceptabilidad de 9 puntos. En el estudio 1a, sabores, a los participantes se les requirió, en grupo independientes, beber una solución, amarga, dulce o agua, que variaban en dulzor, amargor, neutralidad, aceptabilidad, familiaridad, e intensidad, mientras que en el estudio 1b, imágenes, los participantes en cada grupo fueron expuestos a cuatro fotografías que diferían en valencia y arousal (negativas, neutrales y positivas). El resultado de mayor interés fue que, para 8 de los Juicios (aquellos de mayor ambigüedad moral), la evaluación fue más severa tras ver las imágenes negativas y más favorable tras ver las imágenes positivas. Esta investigación fue financiada por los proyectos PSI2009-10627 (MICINN) y P09.SEJ.4752 (Junta de Andalucía).

**Title**: Emotional valence differentially affects severity of moral judgements
**Abstract**: This study assessed whether emotional priming through either pictures with affective value (Exp. 1a) or flavoured solutions (Exp. 1b) affected moral judgements of simulated scenarios. In a preliminary categorization study 10 scenarios were selected, 2 of them were unambiguously judged as either acceptable or not acceptable, whereas the rest (8) were on the average in acceptability and variance (greater moral ambiguity). Participants filled in a moral judgments questionnaire, assessing the acceptability of each scenario using a 9-point Likert scale. In Experiment 1a (flavours) participants in each group were required to drink a solution (bitter, sweet, or water) varying in sweetness, bitterness, neutrality, acceptability, familiarity and intensity; in Experiment 1b (pictures) participants in each group were exposed to four pictures differing in valence and arousal (negative, neutral, and positive). The most interesting result was that, for the 8 ambiguous scenarios, evaluation was significantly more severe after seeing the negative pictures, and more favourable after being exposed to the positive pictures. Research funding: PSI2009-10627 (MICINN) y P09. SEJ.4752 (Junta de Andalucía)

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## TALK SESSION 2A
## Behavioral control

**1**
**Title**: Self-control processes in humans and dogs: Effect of glucose and fructose
**Author**: Miller, Holly C.
**Affiliation**: Université de Valenciennes et du Hainaut-Cambrésis, France
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**Abstract**: Self-control appears to rely on a limited energy resource that can be depleted with prior exertion. There is evidence that glucose may be involved, as the consumption of glucose replenishes the depletion incurred by self-control. An alternative explanation is that the detection of glucose by carbohydrate taste receptors, and nutrient sensing neurons, permits the use of stored energy resources (i.e., brain glycogen) for cognitive processing. This hypothesis was investigated in two studies where dogs and humans were given glucose, fructose or a placebo. Fructose is detected by carbohydrate taste receptors, but is not readily metabolized into glucose, nor does it affect blood glucose levels and thus should not be able to replenish the depletion incurred by self-control if it is uniquely dependent on glucose. Dogs were required to exert self-control (or not) and were subsequently given a glucose, fructose, or calorie-free drink before their persistence on an unsolvable puzzle task was measured. Dogs persisted for the same duration after glucose and fructose, and less after placebo consumption. Humans solved more word anagrams following glucose and fructose consumption relative to a placebo. These observations suggest that the detection of a source of energy is sufficient for improving self-control and problem solving.

**2**
**Title**: Response frequency mediates the depressive realism effect: Statistical and experimental evidence
**Authors**: Fernando Blanco, Helena Matute, & Miguel A. Vadillo
**Affiliation**: University of Deusto, Spain
**Corresponding author email**: fblanco81@gmail.com
**Abstract**: Mildly depressed participants are accurate in detecting their lack of control over uncontrollable outcomes, while nondepressed participants tend to show an illusion of control. The traditional account for this "depressive realism" effect posits that depressed people lack the motivation to deploy some of the optimistic biases that protect self-esteem in nondepressed people. Recently, we proposed an alternative explanation in which the activity level mediates the effect of depressive mood on perceived control. Responding with high frequency in a contingency learning task involving uncontrollable outcomes leads to illusions of control. Therefore, since depressed people tend to take a more passive approach to the task,

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they would be less likely to exhibit the illusion. Our mediational hypothesis can be depicted as a causal chain in which depressive symptoms are the distal cause of the realism, operating via a proximal cause, response frequency. In two studies, we provide statistical and experimental evidence for this hypothesis: First, we conduct a mediational analysis in which the response frequency is found a significant mediator in the depressive realism effect. Second, we conduct an experiment in which we intervene on the hypothesized mediator variable, response frequency, thus cancelling out the effect of depressive symptoms on perceived control.

**3**

**Title**: Reinforcement of schedule-induced drinking in rats by lick-contingent shortening of food delivery

**Authors**: Beatriz Álvarez, Javier Íbias, & Ricardo Pellón
**Affiliation**: National University of Distance Education, Spain
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**Abstract**: Schedule-induced-polydipsia (SIP) has been a theoretical question of concern ever since it was first described (Falk, 1961). It has been classified as adjunctive behaviour, i.e. behaviour that is induced by the reinforcement used but not caused by it. Nevertheless, some authors have argued against this view, claiming that SIP is actually a type of operant behaviour. If this were true, SIP should be controlled by its consequences, which is the major definition of operant behaviour. The present experiment tested this hypothesis. In a first phase of the experiment, a single pellet of food was delivered at regular 90-sec intervals, but the inter-food interval could be shortened depending on licking. The degree of contingency between licking the bottle spout and shortening the delivery of the food pellet was established at values of 100%, 50% and 0%, respectively for each group of animals. Rats that could shorten the interval (100% and 50% contingency) developed SIP compared to those that could not (0%), and the level of acquisition was a positive function of the degree of contingency. In a second phase of the experiment, all groups were exposed to a 100% contingency, which resulted in all rats developing high levels of schedule-induced drinking.

**4**

**Title**: Mecanismos serotoninérgicos en la vulnerabilidad a la bebida compulsiva en polidipsia inducida por programa

**Authors**: Valeria Edith Gutiérrez-Ferre, Margarita Moreno, Silvia Navarro, & Pilar Flores
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**Abstract**: La Polidipsia inducida por programa (PIP) es un procedimiento que induce una bebida excesiva en animales privados de comida expuestos a programas de reforzamiento intermitentes. Se ha propuesto como un modelo de conducta compulsiva, sensible en detectar diferencias indi-

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viduales en ratas. Sin embargo, no está claro cuáles son los mecanismos subyacentes a la vulnerabilidad en PIP. Objetivo: esclarecer los mecanismos monoaminérgicos implicados en diferencias en bebida compulsiva. Método: ratas macho sometidas a programa de tiempo fijo (TF-60s), fueron seleccionadas en dos grupos altos (AB) y bajos bebedores (BB). Se evaluó el consumo de agua, número de lametones y entradas al comedero tras la administración sistémica de distintos fármacos monoaminérgicos. Resultados: primer experimento, se replicó el efecto de la anfetamina en la reducción de bebida compulsiva en PIP, y se estudiaron los efectos de drogas más específicas: atomoxetina (inhibidor selectivo recaptación de noradrenalina), quinpirole (agonista dopaminérgico D2/D3) y citalopram (inhibidor selectivo recaptación de serotonina). Los resultados apuntaron a una implicación especial de los mecanismos serotoninérgicos en las diferencias en bebida compulsiva entre AB y BB, ya que el citalopram redujo la bebida compulsiva en las AB sin afectar a las BB. En un segundo estudio, se profundizó sobre este efecto, evaluando la bebida compulsiva tras la administración de agonistas y antagonistas de los receptores serotoninérgicos (5-HT2A/2C y 5-HT1A). Los resultados mostraron una implicación de los receptores 5-HT2A/C en la bebida compulsiva desarrollada por los AB en PIP. Los resultados se discutirán en el marco del papel desempeñado por los diferentes receptores en la regulación de la bebida compulsiva en PIP y su relación con un fenotipo compulsivo. Este estudio fue financiado por el proyecto del Ministerio de Ciencia e Innovación, Gobierno de España (PSI2009-08626).

**Title**: Serotoninergic mechanisms in vulnerability to compulsive drinking in schedule-induced polidipsia

**Abstract**: The Schedule-Induced Polydipsia (SIP) is characterized by the development of excessive drinking in food-deprived animals exposed to intermittent food-reinforcement schedules. It has been proposed as a model for compulsive behaviour, sensitive to detect individual differences in rats. However, it is unclear what the mechanisms underlying vulnerability in SIP. Aim: to identify monoaminergic mechanisms involved in differences in the rate of drinking. Method: male rats were submitted to fixed-time (FT) schedule with inter-food intervals of 60s, and were divided in high (HD) and low drinkers (LD). Water intake, number of licks and nose-poke response were assessed after systemic administration of different monoaminergic drugs. Results: in the first experiment replicated the effect of d-amphetamine in reducing binge drinking in SIP, and studied the effects of more specific drugs: Atomoxetine (selectively blocks the noradrenaline transporter), quinpirole (D2/D3 agonist) y citalopram (selectively blocks the serotonin transporter). The results suggested a special involvement of serotonergic mechanisms in binge drinking differences between HD and LD, as citalopram reduced binge drinking in the HD without affecting the LD. In a second study, deepened this effect, assessing binge drinking after administration of agonists and antagonists of serotonin receptors

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(5-HT2A/2C and 5-HT1A). The results showed involvement of the receptors 5-HT2A/C in binge drinking developed by the HD in SIP. Results will be discussed in the context of the role of different receptors in the regulation of binge drinking in SIP and its relationship with a compulsive phenotype. This study was funded by a grant from the Ministerio de Ciencia e Innovación of Spain (PSI2009-08626).

**5**

**Title**: La Suplementación Crónica con Colina Dietaria Modula el Cambio Atencional en Ratas Adultas

**Authors**: Hayarelis Moreno[1, 2], Isabel de Brugada[1], & Geoffrey Hall[3]
**Affiliation**: [1]University of Granada, Spain; [2]Simón Bolívar University, Venezuela; [3]University of York, England
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**Abstract**: La suplementación con colina dietaria provoca un incremento en la síntesis y liberación de acetilcolina en el cerebro. Trabajos previos han sugerido que los input colinérgicos corticopetal del sistema del cerebro anterior anormalmente desinhibido está asociado con un déficit en la filtración a estímulos irrelevantes. En el presente trabajo se investigó el efecto de la suplementación con colina en ratas adultas entrenadas en tareas en donde se evalúa la capacidad de los sujetos para reducir la atención prestada a los estímulos. Ratas machos adultas fueron alimentadas con una dieta estándar o suplementada durante 12 semanas. Se realizaron dos experimentos con una preparación de supresión condicionada. En uno de ellos se utilizó el procedimiento de inhibición latente donde los sujetos experimentan presentaciones no reforzadas del estímulo condicionado antes del condicionamiento; el segundo examina el efecto de transferencia negativa de Hall-Pearce, en el que la preexposición reforzada es seguida por un condicionamiento con un reforzador más intenso. En los dos experimentos los sujetos controles mostraron un retraso en el condicionamiento durante la prueba, efecto que es interpretado como índice de la atención reducida al estímulo tras la preexposición. Las ratas suplementadas no mostraron este retraso, aprendieron al mismo ritmo tanto sobre el estímulo preexpuesto como sobre el estímulo nuevo. De esta manera, el procedimiento de suplementación parece interrumpir el mecanismo normal que reduce la atención a estímulos que predicen consistentemente sus consecuencias.

**Title**: Chronic Dietary Choline Supplementation Modulates Attentional Change in Adult Rats

**Abstract**: Dietary supplementation with choline produces an increase the synthesis and emission of acetylcholine in the brain. Previous work suggests that an abnormally uninhibited corticopetal cholinergic input to the forebrain system is associated with a deficit in the filtration of irrelevant stimuli. The present experiments investigated the influence of choline supplementation in adult rats trained on tasks that assess the ability of the subjects reduce the attention paid to a stimulus. Male adult rats were

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fed with a standard or supplemented diet for 12 weeks. Two conditioned suppression experiments were carried out. One used the latent inhibition procedure in which nonreinforced presentations of the target stimulus are given prior to conditioning; the second examined Hall-Pearce negative transfer effect, in which reinforced preexposure is followed by conditioning with a stronger reinforcer. In both experiments control subjects showed retarded conditioning in the final test, an effect interpreted as indicating that attention to the target stimulus had been reduced by preexposure. Rats given the supplement failed to show this effect, learning as readily about preexposed as about novel stimuli. The supplementation procedure thus appeared to disrupt the normal mechanism that reduces attention to stimuli that reliably predict their consequences.

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## TALK SESSION 2B
## Contingency learning and decision making

**1**

**Title**: El efecto del Feedback en la evaluación y toma de decisiones en el comportamiento de riesgo.

**Authors**: Alberto Megías, Antonio Maldonado, Andrés Catena, & Antonio Cándido

**Affiliation**: University of Granada, Spain

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**Abstract**: La presente investigación tiene como objetivo el estudio del comportamiento de riesgo y los procesos responsables del mismo. Para ello, analizamos técnicas de modificación de conducta basadas tanto en el cambio de las consecuencias de la acción (feedback) como del contexto en que se elicitan (conductas urgentes y evaluativas). La tarea de los participantes fue doble, en un bloque evaluaron si las situaciones de conducción presentadas en pantalla conllevaban riesgo; y en otro bloque debían decidir si frenarían ante estas mismas situaciones. Para manipular la variable feedback, en un grupo se incluyó un mensaje de feedback tras la repuestas de los participantes en un 75% de las imágenes arriesgadas ("ha sufrido un accidente"/"el motorista ha sufrido un accidente"); mientras que en el otro grupo no existió feedback (control). Los resultados mostraron que la tarea urgente obtuvo un mayor número de respuestas afirmativas (frenar) y más rápidas que la tarea evaluativa (riesgo). Por otro lado, los participantes frenaron más y evaluaron mayor riesgo cuando se ofreció feedback negativo sobre las respuestas. Estos resultados confirman los modelos de procesamiento dual (automático y controlado) y representan un primer paso en el diseño de programas de evaluación y control de conductas arriesgadas en conducción.

**Title**: The effect of feedback on evaluation and decision making in risky behavior.

**Abstract**: The aim of the current study was to explore risk behavior and its underlying processes. Behavior modification techniques based on both the change of the consequences of action (feedback) and the context in which behavior is elicited (urgent and evaluative behavior) were used. Participants performed two tasks: in one a block they evaluated whether driving situations presented on the screen entailed risk or not, and in another block they had to decide whether they would brake in the same situations. The variable "feedback" was manipulated by including a group in which a feedback message was presented after participants' responses in 75% of the risky images ("you have had an accident"/"the driver has an accident"); while in the other group no feedback was provided (control group). Results showed a larger number of positive (brake) and faster responses in the urgent task than in the evaluative task (risk). In addition, participants

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braked more often and perceived more risk when negative feedback was provided than in the control group. These results are in line with dual processing models (automatic and controlled) and constitute a first step in the design of programs oriented to evaluate and control risky behavior in driving.

**2**
**Title**: Learning processes engaged during human contingency learning measured with recognition priming comply with basic associative theories
**Authors**: Joaquín Morís, Pedro Luís Cobos, David Luque, & Francisco José López
**Affiliation**: University of Málaga, Spain
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**Abstract**: Contrary to claims by inferential theories, recent studies have shown that human contingency learning can be measured using recognition priming tests, under conditions that preclude engagement of high order processes during retrieval. However, it is possible that the associations retrieved are created by high order processes during training. This possibility was tested in a cue competition experiment with two phases. The first one was a trial-by-trial phase, while the second used instructions. Learning was measured with verbal judgments and a priming based test. As predicted by associative theories, priming reflected only the associations learned in the first phase. On the other hand, judgments were sensitive to the relations of both phases. Given these results, the most parsimonious explanations of learning and retrieval when priming measures are used are those of associative theories.

**3**
**Title**: Summation or average? Evidence that people use the simplest non-normative strategies when combining causes
**Authors**: Nerea Ortega-Castro[1], Itxaso Barbería[1], Miguel Ángel Vadillo[1], & A. G. Baker [2]
**Affiliation**: [1] University of Deusto, Spain; [2] McGill University, Canada
**Corresponding author email**: nerea.ortega@deusto.es
**Abstract**: Causal learning theories make different assumptions about how people should combine the influence of different cues presented in combination. Some theories propose that the causal impact of a compound should equal the linear sum of each of the causes in isolation. By contrast, some models such as the Power PC theory suggest that the rational way of computing the causal power of a compound should be arrived at by correcting the sum of the causes by subtracting the overlap between them (the noisy-or rule), a well-established idea in the literature. The present experiments were designed to test whether people use this strategy or simpler non-normative strategies. We present a number of experiments using questionnaires with Internet and student samples. The experiments use different sets of probabilities and several formats for presenting in-

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formation. Three different cover stories were tested to ensure that the participants understand the independence of the causes. Our results in all experiments consistently differ from the predictions of the Power PC theory. People do not seem to calculate the noisy-or rule. We will discuss some possible mechanisms for our patterns of results including the possibility of an intervening inhibitory mechanism and an averaging heuristic.

**4**
**Title**: Summing the influence of independently trained causes
**Authors**: Itxaso Barberia[1], Nerea Ortega-Castro[1], Miguel Ángel Vadillo[1], & Andy G. Baker[2]
**Affiliation**: [1]University of Deusto, Spain; [2]McGill University, Canada
**Corresponding author email**: itxaso.barberia@deusto.es
**Abstract**: Many previous experiments have tried to find out if people represent causal relationships by forming mental models of cause, as described by Cheng's (1997) Power PC theory. The logic of these experiments has usually been to train a target cause in a noisy situation in which other alternative causes of the same outcome are simultaneously in play. In this situation, participants are asked to isolate the individual influence of the target over the outcome. However, fewer researchers have studied the opposite scenario in which people try to determine the combined influence of different causes that have been trained in isolation. We recently conducted a series of experiments exploring this new perspective (Ortega-Castro et al., 2012) and found that people did not combine independent causes in the normative manner described by Cheng (1997) or by the noisy-or combinatorial rule. However, those experiments used a summary presentation format, in which participants were given numeric information about the proportion of outcomes generated by each cause. In the present experiments, participants were not told a priori what the strength of each of the causes was, but this influence had to be inferred through the information acquired in a trial-by-trial manner. This procedure may emulate a more naturalistic episodic learning process. Similar to our previous experiments, results departed from those predicted by Cheng's power.

**5**
**Title**: US magnitude and psychophysical perception of contingency
**Authors**: Carnero, S.; Morís, J.; Acebes, F.; Álvarez, B., & Loy, I.
**Affiliation**: University of Oviedo, Spain; Universidad de Málaga, Spain
**Corresponding author email**: carnerosusana@uniovi.es
**Abstract**: Many learning models have been used to explain different contingency learning phenomena. One of the most successful is the Rescorla-Wagner model (1972). With some values of its parameters, this model predicts the same results as other models like, for example, $\Delta p$. However, with a different set of parameters it makes different predictions. This is especially relevant for some phenomena like the relative validity or the perception of contingency. The psychophysical modulation of contingency

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perception (Morís, Carnero and Loy, in press) is predicted by Rescorla and Wagner model whenever $\beta 1$ (US salience in the reinforced trials) is higher than $\beta 2$ (US salience in non reinforced trials). In two experiments using a magazine procedure, the values of $\beta_1$ and $\beta_2$ were empirically estimated manipulating the magnitude of the US in the effect of perception of contingency. To do so, two magnitudes of reinforcement were employed. Finally, predictions about different $\beta 1/ \beta 2$ ratios were discussed showing that, contrary to the predictions of Rescorla and Wagner model, the psychophysical effect was higher when the value of the ratio $\beta_1 / \beta_2$ was lower.

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## TALK SESSION 3A
## Timing

**1**

**Title**: Effects of a non-relevant duration on time perception
**Authors**: Andréia Kroger-Costa[1], John Wearden[2], &, Armando Machado[1]
**Affiliation**: [1]University of Minho, Portugal; [2] Keele University, UK
**Corresponding author email**: andreiakc@gmail.com
**Abstract**: This study examined the effects of a non-relevant stimulus on time perception using a verbal-estimation and a discrimination tasks. Before the task, three non-relevant durations (short, medium and long) were presented, then the participants were asked to estimate target duration (verbal-estimation task) or to compare two target durations (sample and comparison) in the discrimination task. The pair (non-relevant, target) were divided into four modality combinations: AA (both stimuli were auditory); VV (both stimuli were visual); AV (the non-relevant duration was auditory and the target was visual) and VA (the opposite of AV) and, the set of stimuli (non-relevant, sample and comparison) was auditory or visual. The results suggest that, the non-relevant duration affected the time perception: a) in the verbal-estimation task, the verbal estimation of a target stimulus was longer as larger the non-relevant duration was. b) In the discrimination task, the non-relevant duration produced an overestimation of the sample stimulus only when the non-relevant was long. Concerning to the modality aspect, such an influence of a non-relevant duration was only observed in the within modality situations and mainly with auditory stimuli. These results will be discussed in the light of current theories of timing such as Time-Order-Error and Automatic Timing.

**2**

**Title**: When does integration of temporal maps take place?
**Authors**: Mikael Molet[1], Gonzalo Miguez[2], & Ralph R. Miller[2]
**Affiliation**: [1]University of Lille, France; [2]State University of New York at Binghamton, USA
**Corresponding author email**: mikael.molet@univ-lille3.fr
**Abstract**: Prior research has found that when subjects independently acquire two associations with a common element (e.g., S1-S2 and S2-US), each with its own temporal relationship, they behave as if the two unique cues have a known temporal relationship despite their never having been paired. Seemingly, they have integrated the two associations to create a third association with its own temporal relationship (S1-US). There are two times at which such temporal integration could plausibly occur: at the time of acquisition of the second relationship or at the time of testing. Three lick suppression experiments with rats were performed to determine when integration occurs. This question of the moment of temporal integration was assessed by extinguishing the mediating element (S2). Experiment 1 (us-

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ing sensory preconditioning) and Experiment 2 (using second-order conditioning) found that this manipulation interfered with behavioral control by S1, suggesting that temporal integration occurred at the time of testing. Experiment 3 used spontaneous recovery, a hallmark phenomenon of extinction, to confirm that the S2-alone presentations in Experiments 1 and 2 attenuated integration as a result of extinction of S2. Implications for the temporal coding hypothesis are discussed.

**3**
**Title**: How long is a piece of time? Searching for context effects.
**Authors**: Marilia Pinheiro de Carvalho, Armando Machado, & François Tonneau
**Affiliation**: University of Minho, Portugal
**Corresponding author email**: marilia.pinheiro@yahoo.com.br
**Abstract**: To study context effects on temporal discriminations, pigeons learned to produce an interval by pecking on key A to begin the interval and then key B to end the interval. In the first phase, all subjects learned to produce an interval at least 3-s long. In the second phase, subjects learned to produce a new interval. Half of the subjects learned to produce an interval at least 1-s long (Group 1); while the other half of the subjects learned to produce an interval at least 9-s long (Group 9). At issue was how learning the second interval affected the distribution of the 3-s intervals. We compared the distributions when the 3s was either the shortest (Group 1) or the longest (Group 9) of the two intervals learned. We looked for a context effect such as an assimilation effect or a contrast effect. The results are discussed at the light of current timing models.

**4**
**Title**: Temporal discrimination in pigeons: Coding strategies
**Authors**: Carlos Pinto, & Armando Machado
**Affiliation**: University of Minho, Portugal
**Corresponding author email**: carlos.arop@gmail.com
**Abstract**: What strategies can pigeons develop to perform optimally on a temporal discrimination task? To answer this question, six pigeons were trained on a matching-to-sample procedure with three sample durations (2s, 6s and 18s) and two comparisons (red and green hues). One comparison (eg. red) was correct following 2-s samples and other comparison (eg. green) following both 6-s and 18-s samples. After training, retention intervals ranging from 0 and 20s were introduced between sample and comparisons to contrast the predictions of two coding strategies for this task: the multiple coding hypothesis and the single-code/default hypothesis. According to the multiple coding hypothesis, three response rules are created, one for each sample. According to single-code/default hypothesis, only two response rules are created: a single rule for the 2-s sample and a general “default” rule for any other duration. The results supported the single-code/default strategy: In the retention interval test, correct responses to the longer

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samples remained high, while the number of correct responses to the short sample diminished.

**5**
**Title**: Temporal control: Relative or Absolute
**Author** : Armando Machado
**Affiliation**: University of Minho, Portugal
**Corresponding author email**: armandom@psi.uminho.pt
**Abstract**: A gray square looks darker when next to a white square than to a black square. As Wolfgang Kohler argued, perception often is relative. And time, is its perception also relative? Will a specific time interval seem different when "close" to a shorter than a longer interval? In this talk, I will review a few studies that suggest that time discrimination in animals is relative. Then I will discuss how the same empirical findings may be explained by the Learning-to-Time (LeT) model without presupposing relative temporal control. I conclude that, in the time domain, the difference between absolute and relational control remains rather… gray.

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## TALK SESSION 3B
## Spatial Learning

**1**

**Title**: El papel de la forma del objeto en la conducta exploratoria de ratas: relevancia de vértices y aristas.

**Authors**: Martínez-Escudero, L., Gámiz, F., & Gallo, M.
**Affiliation**: University of Granada, Spain
**Corresponding author email**: lauramartinez@ugr.es

**Abstract**: La tarea de reconocimiento de objetos (basada en la tendencia innata de explorar más los objetos nuevos que los familiares) ha sido ampliamente empleada para explorar la capacidad mnésica en roedores. Los resultados en esta tarea parecen depender de variables de procedimiento que a menudo están mal definidas en los protocolos conductuales. Los rasgos del objeto pueden afectar al comportamiento exploratorio produciendo resultados confusos. Entre otras características del objeto hemos evaluado el efecto de las formas a discriminar en el comportamiento exploratorio de ratas macho Wistar adultas. En una serie de experimentos se dispusieron pares de formas geométricas simples (cubo, esfera, cono, cilindro, prisma hexagonal, pirámide) en un campo abierto y se registró el tiempo de exploración. Los resultados indicaron que la exploración de las formas geométricas dependió significativamente del número de aristas. Así se exploraron más las formas poligonales con aristas que las formas esfericas y curvas. También se está investigando el papel de otros rasgos del objeto tales como tamaño y color. En conjunto los datos sugieren que la naturaleza del objeto puede ser crítico en las tareas de reconocimiento de objetos. Grants PSI2008-03933, PSIC2011-23702 (MICINN. Spain) and HUM02763 (Junta de Andalucía. Spain) both supported by FEDER funding.

**Title**: Role of the shape in the object exploratory behavior in rats: relevance of vertices and edges.

**Abstract**: The object recognition task (based on the innate tendency to explore novel objects more than familiar) has been thoroughly used to explore memory abilities in rodents. However the results seem to depend on procedural variables which are often ill-defined in the behavioral protocols. The object features might deeply affect the exploratory behavior, thus leading to confusing results. Among other object's features we have assessed the effect of the forms to be discriminated in the exploratory behavior of male adult Wistar rats. In a series of experiments pairs of elemental geometric solid forms (cube, sphere, cone, cylinder, hexagonal prism, pyramid) were fixed in a black open plastic chamber and the exploration time was recorded. The results indicated that the exploration time of solid geometric forms was significantly dependent on the number of edges. Thus, the animals explored longer polygonal forms with vertices than spherical and curved forms. The role of other object's features such

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as size and color is also being investigated. In all these data suggest that the nature of the objects to be discriminated can be critical in object recognition memory tasks.Grants PSI2008-03933, PSIC2011-23702 (MICINN. Spain) and HUM02763 (Junta de Andalucía. Spain) both supported by FEDER funding.

**2**

**Title**: Sexual maturation influences the strategies used by female rats to solve a navigation task

**Authors**: Clara A. Rodríguez, V.D. Chamizo & N.J. Mackintosh
**Affiliation**: [1] University of Barcelona, Spain; [2] University of Cambridge, UK
**Corresponding author email**: claraurora@gmail.com

**Abstract**: The purpose of the present set of experiments was to evaluate whether sexual maturation could influence the strategies used by rats to solve a navigation task. In each experiment, rats were trained in a triangular shaped pool to find a hidden platform which maintained a constant relationship with two sources of information, one individual landmark and one part of a pool with a distinctive shape. Then, three test trials were conducted, counterbalanced, and without the platform. In one test trial, both the shape and the landmark were simultaneously presented, although in different spatial positions, in order to measure the rats' preferences. In the remaining two test trials what the rats had learned about the two sources of information was measured by presenting them individually. Experiment 1 compared the performance of female rats of approximately one month old and three months old. Then, Experiment 2 compared ovariectomized rats and sham operated females. Finally, Experiment 3 directly compared adult males and females, juvenile males and females, and ovariectomized rats. A clear effect of sexual maturation was found in the strategies used by female rats to solve the navigation task. Such an effect did not appear in male rats.

**3**

**Title**: Free operant procedure for studying spatial learning in the laboratory rat.

**Author**: Ian N. Johnston
**Affiliation**: University of Sydney, Australia
**Corresponding author email**: i.johnston@sydney.edu.au

**Abstract**: In this talk I will describe some experiments in a custom-built Olton 8-arm radial maze that study free-operant spatial behaviour in the rat. On each trial, one arm of the maze was randomly designated the 'active' arm, and the rat received 10-sec access to sucrose from an automated fluid dispenser in a magazine at the end of the arm. After the reinforcer had been delivered, the next trial began and another arm was randomly designated as the active arm, and this procedure was repeated for each subsequent trial. In addition to this, white curtains surrounded the maze and an overhead data projector with a wide-angled lens projected visuo-

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spatial black and white cues onto the curtains, and/or onto the floor of the maze itself. On each trial, these cues were rotated so they remained in a consistent spatial configuration with the active arm. The results of these experiments indicate that: 1. The rats made significantly fewer errors in finding the active arm in the presence of the visuospatial cues compared to trials when they were absent; 2. The number of errors increased in probe trials when elements of the visuospatial configurations were removed. These studies suggest this would be a useful technique for studying how rats learn to integrate visuospatial cues to find a location in space.

**4**

**Title**: Response to spatial and nonspatial change in wild (WWCPS) and Wistar rats

**Authors**: Rafał Stryjek [1,2], Klaudia Modlińska [2], & Wojciech Pisula[2]
**Affiliation**: [1] Polish Academy of Sciences, Poland; [2] Helena Chodkowska University of Management and Law, Poland.
**Corresponding author email**: wpisula@psych.pan.pl

**Abstract**: The purpose of the experiment was to investigate the effects of domestication on exploration in rats. The comparison was made between wild WWCPS rats and Wistar laboratory rats. The study used a purpose-built maze divided into zones connected with a corridor. Objects were placed in two out of four zones. Their location and shape were subject to experimental manipulation. Rats were subjected to a series of 10 sessions (habituation), followed by a spatial or nonspatial change in the experimental arena, after which another 5 experimental sessions were conducted. The study revealed that wild rats had much higher exploration latency than their laboratory counterparts. At each analyzed stage, Warsaw-Wild-Captive-Pisula-Stryjek (WWCPS) rats spent much more time in the transporter than Wistar rats. Wistar rats spent much more during the experiment on object interaction in the experimental arena. In post-manipulation sessions, however, it was wild rats that explored object zones relatively longer than laboratory rats. No differences in the animals' behavior depending on the type of change were observed. Results suggest that wild rats tend to explore much more cautiously than laboratory rats and are more sensitive to changes in their environment.

**5**

**Title**: Landmark vs. shape learning: new evidence explaining sex differences

**Authors**: V.D. Chamizo, C.A. Rodríguez, & N.J. Mackintosh
**Affiliation**: [1] University of Barcelona, Spain; [2] University of Cambridge, UK
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**Abstract**: Often male and female rats do not use the same strategies when solving spatial tasks. In the study by Rodríguez, Torres, Mackintosh and Chamizo (2010), two groups of rats, one of males and one of females, were trained in a compound cue learning task, where a single landmark and a

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particular corner of a triangular shaped pool, simultaneously presented, both predicted the position of a goal, a hidden platform. Following acquisition, a test trial without the platform pitted these two sources of information against one another. This test revealed a clear sex difference. Females spent more time in an area of the pool that corresponded to the landmark, whereas males spent more time in the distinctive corner of the pool, even though further tests revealed that both sexes had learned about the two sources of information by presenting cues individually. Subsequently, Rodríguez, Chamizo, and Mackintosh (2011) have shown that the shape cue is more salient than the landmark cue for males and vice-versa for females. The present set of experiments shows that the landmark cue is not always preferred to shape learning by female rats and reveals the specific characteristics of a landmark which are responsible for the females' preference.

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## TALK SESSION 4A
## Animal Cognition

**1**
**Title**: Adaptative benefits of classsical conditioning of tentacle lowering to find food in snails (helix aspersa)
**Authors**: Loy, I., Acebes, F., Álvarez, B., & Carnero, S.
**Affiliation**: University of Oviedo, Spain
**Corresponding author email**: iloy@uniovi.es
**Abstract**: It is sensible to think that learning to anticipate the appearance of a biologically relevant event should promote benefits in biological function. In fact, it has been clearly demonstrated that classical conditioning increases the biological efficacy of some behaviors (i.e. reproductive behavior, Hollis, 1990) but, compared to the wide range of classical conditioning preparations, the available data showing benefits of learning to biological function is not very large. Furthermore, some apparently obvious links between learning and biological function have been explicitly called into question. For example, Ungless (2001) found out that snails which lowered the tentacles after being conditioned did not differ in finding food from conditioned snails which did not lowed the tentacle. In a series of experiments we tested this dissociation employing a modified tentacle lowering conditioning procedure (Acebes, et al. 2012). First, snails were conditioned (US: carrot) to lower the tentacles in the presence of a distinctive odour (CS: apple odour). Then they were tested in a task to find the US, the CS or both. The results clearly showed that the conditioned animals found the target faster than the non-conditioned snails, but it is not completely clear what function played the CR of tentacle lowering.

**2**
**Title**: Holding familiar information in working memory is cognitively effortful for monkeys
**Authors**: Benjamin M. Basile, & Robert R. Hampton
**Affiliation**: Emory University, USA
**Corresponding author email**: bbasile@emory.edu
**Abstract**: Imagine a colleague tells you their phone number and then another asks you an unrelated question. This competition for your limited attention will likely make you forget the number. Information in human working memory is usually lost within seconds unless actively maintained. The ability to exert cognitive control over working memory is a central component of most human memory models, is likely a major factor in general intelligence, and may account for many cognitive differences between humans and nonhumans. Despite the importance of cognitive control of memory in human cognition, behavioral evidence of it in nonhuman primates is absent and neurophysiological evidence is indirect. Too often it is uncritically assumed. Here, we show that monkeys' memory for familiar

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images is under active cognitive control. Competing cognitive demands impaired recognition in a demand-dependent manner, indicating that working memory in monkeys requires a limited resource that is divided among ongoing tasks. Strikingly, recognition for equally difficult to remember unfamiliar images was unaffected, demonstrating a dissociation in memory processes within the same memory test. Familiar images are maintained in working memory by an active, cognitively-demanding process, whereas unfamiliar images are recognized using passive, effortless familiarity.

**3**
**Title**: Sequential tool-use in great apes
**Authors**: Gema Martin-Ordas, Lena Schumacher, & Josep Call
**Affiliation**: Max Planck Institute for Evolutionary Anthropology, Germany; Center on Autobiographical Memory Research, Denmark
**Corresponding author email**: ordas@psy.au.dk
**Abstract**: Sequential tool-use (using one tool to reach for another, to enable the retrieval of a reward) is an effective test for planning and goal directed behavior. Previous studies have shown that birds and great apes succeed in such tasks, but fail to show which cognitive mechanisms are involved. In experiment 1, chimpanzees, orangutans and bonobos were presented with an out-of-reach reward, two tools that were available but too short to reach the food and four out-of-reach tools. In different conditions we varied the distance of the food and/or which tools were required to get it. Apes spontaneously used up to 3 tools in sequence to get the reward. Subjects showed a strong preference for the longest out-of reach tool independently of the distance of the food. In experiment 2, we increased the cost of reaching for the longest out-of reach tool. Now apes used up to 5 tools in sequence to get the reward and were more selective in reaching for the out-of-reach tools based on their distance from the food. Planning and goal directed behaviors rather than the use of heuristics best explain these findings.

**4**
**Title**: Control of a continuous response dimension by the numerical stimulus dimension
**Authors**: Eugénia Fernandes, François Tonneau, & Armando Machado
**Affiliation**: University of Minho, Portugal
**Corresponding author email**: gena.fernandes@gmail.com
**Abstract**: Children and adults show different patterns of responses when tasked with assigning non-verbal numerical quantities to a spatial continuum. A shift from a logarithmic to a linear mapping of numbers onto space seems to occur across the lifespan. However, recent studies revealed that preschooler's responses are usually more variable than older humans' and a considerable percentage of children do not differentiate their spatial responses as a function of the numerical stimuli. This study investigated

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how responding in a continuous spatial response dimension becomes under the control of the numerical stimulus dimension. Since a logarithmic-like pattern may be an artefact from a group-level analysis, we present individual data. Furthermore, we examined the influence of a pre-training in a non-numerical continuous stimulus dimension. Preschoolers were initially trained to respond at the endpoints of a yellow bar in a touchscreen: touch the farthest left portion when presented white stimuli, and the farthest right following black stimuli. Next, they were trained to move their responses locations along the bar as a function of intermediate brightness values. Finally, they received a similar procedure with non-verbal numerosities (sets of a variable number of simultaneously presented dots). After being trained with the number-space mappings 'Few'-Left and ´Many´-Right, they were tested with numerosities ranging from "Few" to "Many".

**5**
**Title**: Trial-unique matching- and nonmatching-to-sample in honeybees
**Authors**: Gentaro Shishimi, & P. A. Couvillon
**Affiliation**: University of Hawaii at Manoa, USA
**Corresponding author email**: gentaro@hawaii.edu
**Abstract**: Recent research has extended the comparative analysis of learning in honeybees and vertebrates to concept formation. In the experiments reported here, honeybees were trained in matching- and nonmatching-to-sample problems using a trial-unique procedure -- novel stimuli on every trial. Although in vertebrates, transfer trials after training with repeated stimuli usually are used to assess concept formation, such test trials are not necessary with trial-unique training. Honeybees were trained to visit two adjacent windows. On each trial, one window was opened for the bee to view the sample stimulus, and then the other window was opened for a choice between a pair of stimuli, one the same as the sample and the other different. For bees in Experiment 1 (Matching), choice of the same stimulus was reinforced with sucrose while choice of the different stimulus was punished with stevia. For bees in Experiment 2 (Nonmatching), choice of the different stimulus was reinforced while choice of the same stimulus was punished. Initial choice was recorded and error-correction permitted. The bee drank the sucrose, flew to the hive to unload, and returned to the windows for another trial with completely novel stimuli. The bees solved both tasks, providing strong evidence of concept learning.

**6**
**Title**: Cognitive abilities of small passerine birds: common crossbills and blue tits
**Authors**: Tatyana Obozova, Anna Smirnova, & Zoya Zorina
**Affiliation**: Lomonosov Moscow State University, Russia
**Corresponding author email**: obozovat@mail.ru
**Abstract**: In the present work we investigated cognitive abilities of small passerine birds: common crossbills (Loxia curvirostra) and blue tits (Cya-

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nistes caeruleus) characterized by a relatively low brain complexity (Portman's index of blue tits is 8.77, crossbills is 8.94). Both species were offered with a battery of cognitive tests which had been used earlier in our laboratory to study cognitive abilities of hooded crows (Corvus cornix, large-brained birds whose Portmann's index is about 14). Firstly, we have revealed an ability of crossbills and tits to "object permanence". Crossbills, unlike tits, looked for hidden bait. However they were not able to track its moving. On the contrary, crows easily performed those tasks. Secondly, crossbills and tits were given the entire set of string-pulling tasks. Our results suggested that, unlike crows, members of both species failed to comprehend the physics underlying the object relationships involved in the tasks presented and instead used a proximity based rule. Crossbills were also tested in a generalization paradigm. They seemed to be able to form concepts "more" and "less". Birds transferred their performance to stimuli of new category. However, unlike crows, they could not successfully transferred their performance to stimuli consisted of new number of elements. Thus, common crossbills and blue tits processed relatively lower abilities in solving cognitive tests comparatively with large-brained birds like hooded crows.

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## TALK SESSION 4B
## Exposure Effects

**1**
**Title**: Spatial rather than Feature Learning in Human Visual Perceptual Learning
**Authors**: M. Manuela Moreno-Fernández[1], & Jose Prados[2]
**Affiliation**: [1]University of Jaén, Spain; [2]University of Leicester, UK
**Corresponding author email**: mmmoreno@ujaen.es
**Abstract**: In one experiment participants were pre-exposed to two similar checkerboard grids, AX and X, in alternation, whereas a third stimulus, BX, was exposed in a separate block of trials. Participants were then required to detect the differences between pairs of stimuli (e.g., AX vs. X; BX vs. X). A was better detected than B when they were presented in the same location during the pre-exposure and test phases. This is what can be predicted from current theories of perceptual learning, which state that intermixed pre-exposure maintains relatively high the perceptual salience or effectiveness of the unique features. However, when the locations of the features were swapped during the test (A was tested in the location occupied by B during pre-exposure and vice versa), B was detected better than A, suggesting that intermixed pre-exposure enhances the attention paid to the location of the unique features rather than the features themselves.

**2**
**Title**: Masking task during stimulus pre-exposure: Perceptual learning or learned irrelevance?
**Authors**: Antón Navarro, Naiara Arriola, Asier Martierena, & Gumersinda Alonso
**Affiliation**: University of the Basque Country, Spain
**Corresponding author email**: anton1177@gmail.com
**Abstract**: A series of experiments assessed whether the effect of stimulus pre-exposure on the subsequent ability to differentiate the pre-exposed stimuli is altered by the presence of a masking task. In Experiment 1, participants received either intermixed pre-exposure to AX and BX, blocked pre-exposure, or no pre-exposure. During pre-exposure a masking task was presented in which a sequence of letters and one number appeared very quickly in the centre of the stimulus and participants had to indicate, on each trial, what number appeared. During a subsequent same/different task with AX and BX, participants not pre-exposed to the stimuli performed better than those pre-exposed. Furthermore, after blocked pre-exposure participants displayed a longer reaction time than following either intermixed pre-exposure or no pre-exposure. In Experiment 2, which employed the identical procedure except for the absence of the masking task, these differences disappeared. The results are discussed in terms of learned irrelevance, latent inhibition, and perceptual learning.

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**3**

**Title**: The role of the motivational state in the US preexposure effect with an appetitive procedure

**Authors**: Marta Gil[1], Isabel de Brugada[1], Michelle Symonds[2] & Geoffrey Hall[2]
**Affiliation**: [1]University of Granada, Spain; [2]University of York, UK
**Corresponding author email**: martagil@ugr.es

**Abstract**: In a series of experiments, animals received exposure to a sucrose solution. Subjects were then given a flavour preference procedure to test the ability of the sucrose to act as an unconditioned stimulus (US), with a neutral flavour as a conditioned stimulus (CS). Previous work has established that such preexposure retards the acquisition of a conditioned preference The experiments reported here were aimed at exploring the role of the motivational state of the animals (hungry or thirsty) in generating this US preexposure effect. In our initial experiments, some of the rats were maintained thirsty throughout the experiment whereas the others were hungry, and in subsequent experiments the motivational state was changed at various stages between conditioning and test. Results are discussed in terms of theories of the US preexposure effect that make predictions regarding the role of motivational state at various stages of the experimental procedure. Resarch funded by PSI2009-07513 (MEC) & #HUM-02763 (Junta de Andalucía) projects.

**4**

**Title**: El efecto "Fácil-a-Difícil" con ClLi bebido en ratas

**Authors**: Naiara Arriola, Antón Navarro, Asier Martiarena, & Gumersinda Alonso
**Affiliation**: University of the Basque Country, Spain
**Corresponding author email**: naiara.arriola@ehu.es

**Abstract**: Se valoró el efecto "fácil-a-difícil" en una serie de experimentos realizados con ratas. Se empleó para ello una discriminación Pavloviana del tipo AX+ X-, siendo A una solución de Cloruro de Litio (LiCl, 0.15 M) y X una solución de sacarina en diferentes concentraciones (0.15, 0.3, 0.6 y 1.2 %). La discriminación entre AX y X fue difícil cuando la concentración de X fue alta y fácil cuando la concentración fue baja. El aprendizaje previo de una discriminación AX+ X- fácil aceleró el posterior aprendizaje de la discriminación AX+ X- difícil, pero no lo hizo la exposición previa a AX y X, siendo A una solución de Cloruro de Sodio (NaCl, 0.15 M) y X la concentración más baja. Un incremento progresivo de la concentración de X, tanto durante la discriminación AX+ X- previa como durante la exposición a AX y X previa, no facilitó el posterior aprendizaje de la discriminación difícil AX+ X-. Estos resultados son discutidos en relación a diferentes teorías propuestas para explicar el efecto de aprendizaje perceptivo.

**Title**: Easy-to-Hard effect with ingested LiCl in rats

**Abstract**: Experiments were conducted to assess the easy-to hard effect in rats, using Pavlovian AX+, X- discrimination. Stimulus A was a solution of Lithium Chloride (LiCl, 0.15 M) and stimulus X was a saccharine solution of

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varying concentrations (0.15, 0.3, 0.6, and 1.2 %). Discrimination between AX and X was harder with higher concentrations of X and it was easier with lower concentrations of X. Prior learning of the easier AX+, X- discrimination facilitated subsequent learning of the harder AX+, X- discrimination, whereas prior exposure to AX [A being a solution of Sodium Chloride (NaCl, 0.15 M)] and the lowest concentration X, did not. Progressive increments in the concentration of X, either during a previous AX+, X- discrimination, or during previous AX, X exposure, failed to facilitate learning the harder AX+/X- discrimination. These results are discussed in terms of different theories proposed to explain the perceptual learning effect.

**5**

**Title**: Transferencia del Aprendizaje Perceptivo a estímulos novedosos tras la preexposición alternada AX / BX

**Authors**: Antonio A. Artigas[1], & José Prados[2]
**Affiliation**: [1]University of Barcelona, Spain; [2]University of Leicester, UK
**Corresponding author email**: talvarez@ub.edu

**Abstract**: Diferentes grupos de ratas reciben preexposición corta (4 días), o larga (10 días), a dos sabores compuestos (AX y BX) siguiendo un programa de preexposición alternado o en bloques separados de ensayos. Después de la preexposición, todos los sujetos pasan por un ensayo de condicionamiento aversivo o de un sabor preexpuesto, o de uno novedoso. En todos los experimentos, a continuación de la fase de condicionamiento se lleva a cabo una prueba de generalización con un estímulo novedoso (NX). Los resultados muestran un mayor consumo de NX en los grupos de preexposición alternada, tanto en condiciones de preexposición corta como larga. Esta transferencia del Aprendizaje Perceptivo, desde estímulos preexpuestos a novedosos, podría ser explicada a partir de la modulación diferencial de la saliencia de los elementos distintivos (A y B) y comunes (X) durante la preexposición alternada en comparación a la de bloques (Hall, 2003; Mondragón & Murphy, 2010).

**Title**: Perceptual learning transfer to novel stimuli after intermixed pre-exposure AX / BX

**Abstract**: Rats were given Short (4 days) or Long (10 days) pre-exposure to flavour compounds sharing a common element (AX and BX) according to an Intermixed or a Blocked schedule. In several experiments, after pre-exposure all subjects were given taste aversion conditioning either with a pre-exposed or a non pre-exposed stimuli. In all experiments, following conditioning a generalisation test with a novel stimulus (NX) took place. The results showed a larger consumption of NX in the Intermixed than in the Blocked groups both after short and long pre-exposure. This transfer of perceptual learning, from familiar to novel stimuli, could be explained as the consequence of differential salience modulation of unique (A and B) and common elements (X) during intermixed in comparison to blocked pre-exposure (Hall, 2003; Mondragón & Murphy, 2010).

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## TALK SESSION 5A
## Cue competition

**1**

**Title**: Blocking in snails, rats and humans using a within-subject design

**Authors**: Jose Prados[1]; Beatriz Alvarez[1, 2]; Ignacio Loy[2]; Felix Acebes[2]; Joan Sansa[3]; & M. Manuela Moreno-Fernández[1, 4]

**Affiliation**: [1] University of Leicester, UK; [2] University of Oviedo, Spain; [3] University of Barcelona, Spain; [4] University of Jaén, Spain

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**Abstract**: In a study using honey-bees, Blaser et al. (2008) failed to produce a within-subject blocking effect. Given that traditional between-subject studies on blocking rarely controlled for some sources of confound, this work was said to cast doubts on the very existence of the blocking effect. There is, however, at least one reliable demonstration of within-subject blocking in a fear conditioning task with rodents (e.g., McNally & Cole, 2006). The question that arises is whether blocking is a phenomenon that can only be observed in vertebrates (like rats), but not in invertebrate organisms (like bees). Our experiments demonstrate the blocking effect using the same within-subject formal design in snails, rats and humans in different learning preparations (appetitive conditioning in snails, aversive conditioning in rats, and virtual spatial learning in humans). Our results show that the blocking effect is a general phenomenon that can be demonstrated in different animal phyla, including invertebrate species; and suggest a general prevalence of the principles that rule learning in the animal kingdom.

**2**

**Title**: Changes in compound cues modulate information retrieval after interference treatments.

**Authors**: Carmelo P. Cubillas, & Miguel A. Vadillo

**Affiliation**: University of Deusto, Spain

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**Abstract**: Several studies have shown that a context change can produce the retrieval of seemingly forgotten pieces of information. For instance, in an interference paradigm a cue is paired with different outcomes in different moments. If tested immediately after the interference treatment, the second-learned information prevails over the first-learned one. However, if the cue is tested out of the context in which the interfering information was learned, the first-learned information is retrieved. Although during the last years several authors have focused on the role of contexts in this kind of effects, the definition of context itself is far from clear. Usually, the context is defined as a set of low-salience, non-predictive cues that remains in the background of the task. But a context might be more than this. We conducted four experiments showing that changing a simple or compound cue can have the functional effects of

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a context change. The results showed that removing a cue from a compound cue (Experiments 1-3) and adding or changing a cue (Experiment 4) also cause the retrieval of first-learned information. We suggest that the current definition of context is too narrow. Our results indicate that punctuate, salient cues should also be considered part of the context.

**3**
**Title**: Schedule-induced drinking: Blocking and marking effects
**Authors**: Robert Boakes & Angela Patterson
**Affiliation**: University of Sidney, Australia
**Corresponding author email**: bob.boakes@sydney.edu.au
**Abstract**: In 1961 Falk reported that non-thirsty rats on an intermittent schedule of food reinforcement came to drink copious amounts of water when they had access to a water bottle. Why such schedule-induced drinking (SID aka SIP) develops has not been fully explained. Pellón (2008) argued that this 'adjunctive' behavior is acquired on the basis of superstitious conditioning. We report two experiments supporting this theory that were modeled on Williams' (1990) study of the acquisition of lever pressing with 30-s delay of reinforcement. In our basic procedure a pellet is delivered every 30 s to a rat that has unrestricted access to a water bottle. Experiment 1 used a blocking design to demonstrate that a brief light presented prior to each pellet delivery retarded the development of drinking. Experiment 2 found that a brief tone sounded whenever a rat licked the water spout functioned to mark this response insofar as drinking developed much more rapidly. These and other results point to the similarity between long-delay instrumental learning and adventitious reinforcement of drinking.

**4**
**Title**: The role of attention in the blocking effect
**Authors**: Francisco Arcediano, & Duncan Y. Amegbletor
**Affiliation**: Auburn University, USA
**Corresponding author email**: pako.arcediano@auburn.edu
**Abstract**: Blocking refers to diminished (blocked) responding to Stimulus X if, during training, X is presented in compound with another stimulus, A, that has already been established as a predictor of the outcome they both signal (i.e., A-Outcome, then AX-Outcome.) Most theories of learning explain the blocking effect as a deficit to acquire the X-Outcome association. For example, a common argument is that the deficit in acquiring the X-Outcome association arises from decreased attentional resources being allocated to X because it does not provide relevant information about outcome occurrence. We assessed this attentional hypothesis in a within-subjects preparation using gaze behavior as a measurement of allocation of attentional resources to the blocked and blocking stimulus. The role of attention and its impact on responding to the blocked stimulus will be discussed.

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## TALK SESSION 5B
## Context, extinction, and neophobia

**1**
**Title**: The context effect in a temporal discrimination task with an extended test range
**Authors**: Ana Catarina Vieira de Castro, & Armando Machado
**Affiliation**: Universidade do Minho, Portugal
**Corresponding author email**: castro.anacatarina@gmail.com
**Abstract**: The temporal double bisection task has been extensively used to contrast the predictions of two important models of time perception, the Scalar Expectancy Theory (SET) and the Learning-to-time model (LeT). In this task animals learn two temporal discriminations. In the presence of a red and a green key, red is correct after 2s and green after 6s. In the presence of a blue and a yellow key, blue is correct after 6s and yellow after 18s. A critical result, which LeT but not SET can explain, is the context effect: when the sample duration ranges from 2 to 18s and the animal has to choose between green and blue, the preference for green increases with sample duration. The present study investigated how animals behave in the critical test between green and blue when they are presented with durations shorter than 2s and longer than 18s, additionaly to intermediate ones. This procedure brings a further test of the two models of timing. Whether SET predicts indifference for the entire range, LeT predicts that the context effect holds for durations inside the training range and that the animal tends to indifference for durations shorter than 2s and longer than 18s.

**2**
**Title**: Extinction makes conditioning time-dependent
**Authors**: Rodolfo Bernal-Gamboa[1], José E. Callejas-Aguilera[2], Javier Nieto[1], & Juan M. Rosas[2]
**Affiliation**: [1]National Autonomous University of México, México; [2]University of Jaén, Spain
**Corresponding author email**: mictlangk@hotmail.com
**Abstract**: Three experiments explored whether forgetting of CS-US associations depended on extinction of a different association in rats. Experiment 1 found that when rats were conditioned an extinguished with flavor X, subsequently acquired conditioned aversion to flavor Y was reduced by a 19-day retention interval, something that did not occur when X and the US were presented unpaired. Experiments 2a and 2b found that when rats received training and extinction in one of two tasks (running for water in a straight alley in Experiment 2a, and conditioned aversion to sucrose in Experiment 2b), subsequent learning of the alternative task was forgotten over the 19-day retention interval. These results are similar to those previously found when manipulating physical and conceptual contexts in

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rats and humans, suggesting that time may play the role of a context on information retrieval.

**3**
**Title**: The extinction of instrumental response impairs the outcome-selective reinstatement, but passage of time does not.
**Authors**: Sánchez-Carrasco, Livia, Garcia-Hernández, Carolina, & Nieto, Javier
**Affiliation**: National Autonomous University of México, México
**Corresponding author email**: livia@unam.mx
**Abstract**: Two experiments were designed to analyze the effect of extinction and passage of time on outcome-selective reinstatement of an instrumental response. In each experiment rats were trained on two responses with two different outcomes, then both responses were extinguished in order to assess the impact of the non-contingent outcome deliveries on lever pressing reinstatement. In Experiment 1, six groups of rats were exposed to six different lapses of time (i.e. 0h, 24h, 48h, 72h, 164h y 264h) after extinction. Results showed that simply passage of time does not impair the outcome-selective reinstatement effect. In Experiment 2 we used three different lengths of extinction (i.e. 3, 6, 12 sessions), our findings showed selective reinstatement just in groups with shortest extinction length. These results are discussed in relation to associative and non-associative theories of the outcome representation.

**4**
**Title**: An associative explanation of lithium-enhanced flavor neophobia.
**Authors**: Marcial Rodríguez, & Zoé García
**Affiliation**: University of Granada, Spain
**Corresponding author email**: marcial@ugr.es
**Abstract**: Rejection of novel flavors (neophobia) is increased when rats are suffering the effects of a lithium chloride injection. In three experiments we assessed the course of the ingestion under these circumstances in a very close way (through 60 seconds intervals). Experiments 1 and 2 confirmed that drinking suppression does not occur with a highly familiar fluid (water) but it does with a novel flavor (sucrose). Data also revealed that the rejection of the flavor occurs all of a sudden, and after an initial period during which the ingestion is normal. In Experiment 3 the access to the flavor after lithium administration was restricted to 4 minutes, and then it was presented again two days later, i.e., when animals were recovered from illness. Results in the first test indicated that animals injected with lithium consumed the same amount of sucrose than those treated with saline; however, in the second test the experimental group consumed less than the control. These results agree with the idea that a sickness state can change the palatability of a new flavor very quickly. Maybe rejection of novel substances after lithium administration could be better explained as a learned effect rather than as a sensitization of neophobia.

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# POSTERS

## POSTERS SESSION I

## Memory and Cognition (MC)

**MC-1**
**Title**: Spontaneous object recognition memory in aged rats: Complexity versus similarity
**Authors**: Gámiz, F., & Gallo, M.
**Affiliation**: University of Granada, Spain
**Corresponding author email**: fernandogamiz@ugr.es
**Abstract**: Previous work on the effect of aging on spontaneous object recognition (SOR) memory tasks in rats has yielded controversial results. Although there is agreement regarding age-related impairments at retention intervals of 24 hours, conflicting results have been reported at shorter delays. In a series of experiments we have assessed the potential relevance of the type of object used in determining the performance of aged rats in SOR tasks. In the first experiment using standard objects naïve male 24-month-old rats exhibited retention impairments compared with adult rats at 24 h but not 10 sec, 60 sec or 1 h. delays. At 1 h retention intervals no differences between adult and old rats were found in a high-similarity SOR task using elemental pyramids but aged rats exhibited inability to recognize the novel object when clearly different complex forms were applied. These findings support a critical role of complexity in the recognition memory deficits associated with aging. Also, the results provide insight on the potential brain areas involved in the age-related memory deficits.
Grants PSI2008-03933, PSIC2011-23702 (MICINN. Spain) and HUM02763 (Junta de Andalucía. Spain) both supported by FEDER funding.

**MC-2**
**Title**: A demonstration of Episodic-like Memory in one trial with preschool children
**Authors**: Angélica Alvarado, Rosalba Juárez, Karla Méndez & Javier Vila
**Affiliation**: National Autonomous University of México, México
**Corresponding author email**: aserena77@hotmail.com
**Abstract**: Episodic Like-Memory (ELM) can be conceptualized by a minimalist definition, in terms of the integration of information about of what where and when of an event (Clayton and Dickinson, 1998). At present this effect has been demonstrated in various species, but some critics have argued that the animals learned to solve the task by acquiring semantic knowledge because the training employed consisted of several trials. The ELM procedure is difficult to study in humans because episodic memory

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involves a collection of autobiographical episodes and it´s occurs in one single trial (Russell & Davies, 2012). For study this idea we designed an experiment using a hide and seek task in one trial. Four groups of participants hid 4 coins in three containers (A, B and C). Test phase consisted of asking participants where they had found the coins of his preference. During phase 1 only the container A stored 4 coins of $5, during phase 2, only the container B stored 4 coins of $1.One group received the test after 24h of training, and the other received the test immediately. For the other two groups was applied the same procedure but the containers A and B stored 4 coins of the same value. Results showed that children make their choice based on value and moment (recent or distant) of the experiences. These data showed an experimental task for study ELM in children using one trial.

**MC-3**
**Title**: Spatial memory in hamsters: The role of pre-choice behaviors in the Radial Arm Maze
**Authors**: Maryed Rojas Leguizamón, Nataly Yáñez, & Felipe Cabrera
**Affiliation**: University of Guadalajara, México
**Corresponding author email**: fcabrera@cencar.udg.mx
**Abstract**: Rodents' spatial memory is traditionally assessed in the radial arm-maze (RAM). An accurate responding-pattern of the subjects in the RAM is described as the tendency to visit a new arm after each choice (i.e. win-shift strategy). When this pattern of responding is found, it is said that the animal remembers the places passed during previous choices. In the present experiment 12 hamsters were assessed in the RAM in two conditions: The memory-task condition, in which feeders were not rebaited after each visit, and the free-traverse task condition, in which feeders were rebaited. We registered and categorized the behaviors that the subjects emitted in the central area before each arm choice. Results showed that even in the free-traverse task condition, when hamsters did not require remember the places passed, they revealed a tendency to select new arms; nevertheless, more pre-choice behaviors characterized the memory task condition.

**MC-4**
**Title**: Dynamic average of negative value experiences in information retrieval
**Authors**: Luis Jesús López-Romero, Karina Segura-Flores, Angélica Alvarado-García, & Javier Vila
**Affiliation**: National Autonomous University of México, México
**Corresponding author email**: aserena77@hotmail.com
**Abstract**: Studies in animal cognition propose the Temporal Weighting Rule (TWR) as a possible explanation of various recovery information phenomena (Devenport & Devenport, 1994). TWR predicts that subjects performance is based on relative value and distance of learning experiences related to foraging behavior. Some predictions of TWR have been observed with humans using an instrumental task with positive consequences choices of different values (Lopez, Alvarado & Vila 2010). The present experiment exam-

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ined some predictions of TWR in humans using an instrumental choice task between different consequences with negative value (loss of reinforcers), manipulating consequences value and recency (immediate or distant past). Results replicated predictions of TWR when the consequences are positive (integration of information within 24 hours). While in the task with negative consequences, results showed that recent learning experience was more chosen after both training-test intervals (immediate and distant).

**MC-5**
**Title**: Developmental trajectories of working memory in young, adolescent, and adult chimpanzees
**Authors**: Sana Inoue
**Affiliation**: Great Ape Research Institute, Hayashibara Co., Ltd., Japan
**Corresponding author email**: sinoue@gari.jp
**Abstract**: Young chimpanzees can outperform adult chimpanzees and humans in tasks measuring working memory (Inoue and Matsuzawa, 2007, 2009). Here, the same task was introduced to three adolescent chimpanzees (12- to 14-years-old) to examine whether these abilities would have different developmental trajectories. Similar to previous work, two tasks were used: a masking task and a limited-hold task. Both of these tasks required subjects to remember the locations of numerals that briefly appeared on a monitor at random positions. In the masking task, subjects had unlimited time to remember the locations before making their first response, while in the limited-hold task, they had only a short amount of time (650ms, 430ms, or 210ms). In the masking task, performance was between that of adults and young chimpanzees, with participants remembering 4 to 5 numerals. In the limited-hold task, their performance decreased as the duration became shorter, a pattern consistent with adult, but not young, performance. The overall results indicate that working memory capacity decreased with age, and that only young chimpanzees display high eidetic imagery like capacities.

**MC-6**
**Title**: Numerical competence in angelfish: the influence of non-numerical cues on shoal size choice
**Authors**: Luis M. Gómez Laplaza
**Affiliation**: University of Oviedo, Spain
**Corresponding author email**: lmgomez@uniovi.es
**Abstract**: Over the last decades, a wealth of research has focused on the origin and nature of quantificational abilities in human and non-human animals. Although studies, mainly in human infants and non-human primates, have provided careful controls for non-numerical confounds such as continuous variables that covary with number, in other animal species the potential cues used to discriminate stimuli have not been properly investigated. In this study, the influence of two prominent non-numerical variables, namely overall space occupied and swimming activity of the stimulus shoals on quantity discrimination in angelfish (Pterophyllum sca-

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lare), was examined. The stimulus shoals were constituted by the previous successfully discriminated contrasts (10 fish vs. 5 fish, and 3 fish vs. 2 fish ). Manipulation of the overall space occupied by the contrasting shoals revealed that this variable did not affect preference of angelfish, either when large or when small shoals were contrasted. When controlling for the effect of swimming activity by matching this variable between the shoals, angelfish failed to exhibit preference for any of the shoals in the 10 vs. 5 comparisons, whereas they chose the larger shoal in the 3 vs. 2 comparisons. These results suggest that angelfish did not rely on swimming activity of the stimulus fish when discriminating between small shoals. However, the results obtained for the larger shoals together with those obtained in the control treatments suggest that activity may influence quantity discrimination under these circumstances.

**MC-7**

**Title**: Designing tasks for testing Theory-of-Mind abilities in dogs (Canis lupus familiaris)

**Authors**: Teresa Marías Luca de Tena[1], Federico Guillén-Salazar [1,2], Fernando Colmenares[1]

**Affiliation**: [1]Complutense University of Madrid, Spain; [2]CEU University Cardenal Herrera, Spain

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**Abstract**: A number of tests have been designed and used so far to study Theory of Mind (ToM) abilities in nonhuman animals. These tests have addressed different components of ToM, have produced mixed results, and have been conducted in a limited number of species. The objective of the present study was to design a task to explore the ability of dogs to understand that humans may hold false-beliefs. We designed a nonverbal, change of contents task, adapted from one used with children (Krachun et al., 2010), and test it with two dogs. We found that dogs did not pass the test. We also tested children known to have passed the standard Sally-Anne ToM test, and found that they did not pass the task either. They appeared to resort to simple associations learned during the test's training process rather than to their ToM skills. This study provides further support for the idea that negative results may reflect the inadequacy of the experimental task, rather than the lack of the cognitive skill being tested. It also highlights the important role of comparative studies to elucidate whether cognitive abilities are unique or shared by different species and which task-or contextual-related factors may mask a species' cognitive potential. This is especially so when the species compared are nonverbal animals versus verbal humans.

MC-8

**Title**: Relevance of intra and extra-maze visual cues for spatial orientation in the toad *Rhinella arenarum*

**Authors**: Rubén N. Muzio, Florencia Daneri, & Emma B. Casanave

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**Abstract**: The use of environmental visual cues for spatial orientation is an important ability. Mammals orientate in space using multiple environmental cues of the surrounding world and setting spatial relationships between them. Amphibians also have the capacity of spatial orientation, but it is still unknown processes involved. Previous studies in our lab showed that toads use intra and extra-maze visual cues to orientate. This work attempts to establish the relative significance they have in a orientation task.We trained toads (*Rhinella arenarum*) in a find-water orientation procedure using a transparent open field (to provide access to the context -extra maze- visual cues of the training room) with visual cues placed in the wall –intra maze. After acquisition it was tested the relevance of each type of visual cue: (i) separately, by hiding the extra maze cues with an opaque curtain, or by removing the intra maze cues; (ii) simultaneously, by setting them in conflict -rotation of intra maze cues. Tests revealed that toads use both types of visual cues to find the reinforcer inside the open field, but extra maze cues are more relevant to reach the spatial goal. Results are discussed in an evolutionary frame.

## Pre-exposure Learning (PL)

**PL-1**
**Title**: Stimulus pre-exposure effect on generalization of conditioned taste aversion in rats assessed by the differential scores
**Authors**: Rocío Angulo & Gumersinda Alonso
**Affiliation**: University of the Basque Country, Spain
**Corresponding author email**: rocio.angulo@ehu.es
**Abstract**: Taste aversion learning to one stimulus (a compound AX in Experiments 1 and 2, or single X in Experiment 3) was established after repeated pre-exposures to it, a similar one, or without previous experience with any stimulus. Generalization of the conditioned aversion to a familiar or novel stimulus was then assessed by the difference in consumption between the test stimulus and the conditioned stimulus (CS). Even when stimuli were initially discriminable, and the aversion acquired by the CS was lower following pre-exposure, difference scores were always higher when the test stimulus had been pre-exposed without consequences. These results suggest that generalization between stimuli could be affected by the specific knowledge about the stimulus involved on test. The extent to which mechanisms of perceptual learning, latent inhibition, or sensory preconditioning might be implicated is discussed.

**PL-2**
**Title**: Analysis of the associative and non-associative hypotheses of the US-preexposure effect in infant rats.
**Authors**: Arias, C., Gaztañaga, M. & Chotro, MG
**Affiliation**: University of the Basque Country, Spain

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**Corresponding author email**: afelicidade@yahoo.es
**Abstract**: The unconditioned stimulus preexposure effect (US-PE) is the attenuation of the acquisition of an aversion induced by a previously experienced US. Two main explanations have been proposed for this phenomenon: tolerance to the effects of the US (non-associative hypothesis) and contextual blocking (associative hypothesis). According to some authors, preweanling rats do not easily acquire contextual conditioning, which would predict a weak US-PE. However, recent evidences of strong US-PE in infant rats have been found. In this study a series of experiments test both, the associative and the non-associative hypotheses of US-PE in infant rats using taste aversion conditioning. Preweanling rats were preexposed to LiCl before conditioning of a flavor with this same US. Results show that: a) presentation of the US in the home cage or in a different context from conditioning does not affect the magnitude of the US-PE, b) non-reinforced exposure to the context after conditioning does not alter the expression of the US-PE, and c) preexposure to the US does not affect the strength of the hypothermic unconditioned response. These results do not support either of both main hypotheses (tolerance or contextual blocking) proposed to account for the US-PE in rats. (Basque Government IT-276-07, Ramon y Cajal contract to CAG).

**PL-3**

**Title**: Stimulus pre-exposure and stimulus recognition in humans
**Authors**: Naiara Arriola, Antón Navarro, Asier Martierena, Mª del Carmen Sanjuán, Joxean Iraola, & Gumersinda Alonso
**Affiliation**: University of the Basque Country, Spain
**Corresponding author email**: naiara.arriola@ehu.es
**Abstract**: Three experiments assessed the recognition of visual stimulus by same/different judgments and reaction time during repeated exposure and two subsequent tests: a forced choice task and a stimulus completion task. During pre-exposure accuracy increased whereas reaction time decreased. In general, performance during testing was better for participants who had been pre-exposed to a simple rather than a complex stimulus, and improved with both increasing trials and the inter-trial intervals during pre-exposure. These results are discussed in stimulus recognition and perceptual learning frameworks.

**PL-4**

**Title**: The taste preexposure effect in humans using a detection task.
**Authors**: José A. Cabello Cabello, Manuel M. Ramos-Álvarez, Teresa L. Martín-Guerrero, & Concepción Paredes-Olay
**Affiliation**: University of Jaén, Spain
**Corresponding author email**: cparedes@ujaen.es
**Abstract**: The taste preexposure effect has been at great length studied in non-human animals. The discrimination between two similar tastes (A and B) is easier after the alternate preexposure to the tastes (ABABAB...) than after a blocked preexposure (AAA...BBB...). This effect is very difficult to be found in

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humans (see Dwyer, Hodder y Honey, 2004 using an aversive-gustative training). In these experiments we use the Signal Detection Theory (TDS) methodology, that makes the separation between the sensorial and decisional process possible, to test the taste preexposure effect in human beings. The participants must carry out a salt's detection task (yes-no). We use two different ways of alternate preexposure to salt+lemon+water / lemon +water: one of the groups (Gr. 1) knows that he is been preexposed to two different tastes in an alternate way but the other group (Gr. 2) does not know it. The experiments also differed in the instructions used in each case (more and less specific). In both experiments a preexposure effect was found in sensorial but not in the decisional process only in the Group 2. The implications of these results for research in human discriminative learning are discussed.

**PL-5**

**Title**: Latent inhibition and facilitation of conditioned taste aversion in infant rats

**Authors**: Gaztañaga, M., Díaz-Cenzano, E., Arias, C, & Chotro, M.G.
**Affiliation**: University of the Basque Country, Spain
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**Abstract**: In adults, stimulus preexposure generally induces latent inhibition effect. Early in ontogeny this effect is rarely found and facilitation of conditioning is rather seen. The effects of stimulus preexposure on conditioned taste aversion were investigated in 2-week-old rats. On postnatal day 13 pups received 0, 1 or 3 preexposure trials to saccharin. After this, all pups received the conditioned stimulus saccharin followed by the unconditioned stimulus: saline, or a 0.15M LiCl dose, or a 0.30M LiCl dose. On PD14, the same conditioning procedures were repeated and saccharin intake was registered. On PD15 saccharin consumption was again tested. After 1 conditioning trial, without preexposure only the strong US induced taste aversion, while with preexposure the aversion was observed with both doses. Three preexposure trials reduced taste aversion observed with the highest dose. After 2 conditioning trials all conditioned groups showed taste aversion. Stimulus preexposure can either facilitate conditioning or induce latent inhibition in infant rats depending on the amount of stimulus preexposure, the intensity of the US, and the number of conditioning trials. This early learning is not generalized to other tastes. (MEC PSI2011-24231 and Basque Government IT-276-07)

**PL-6**

**Title**: The US-preexposure effect with an appetitive procedure: exploring the role of motivational factors

**Authors**: Marta Gil[1], Michelle Symonds[2], Geoffrey Hall[2], & Isabel de Brugada[1]
**Affiliation**: [1]University of Granada, Spain; [2]University of York, UK
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**Abstract**: Prior exposure to a stimulus will result in a retardation of subsequent conditioning when that stimulus is employed as an unconditioned stimulus (US) in a classical conditioning procedure. In a series of

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experiments, we sought to explore the conditions under which this US preexposure effect could be obtained using an appetitive conditioning preparation. In our first experiment, hungry and thirsty rats given prior exposure to either sucrose or saccharin showed weaker subsequent conditioning when either of these flavours served as the US in a conditioned flavour preference procedure - that is, the US preexposure effect was obtained with both sucrose and saccharin. In a second experiment, we explicitly compared the effectiveness of motivational state (either hungry or thirsty) in generating the US preexposure effect using saccharin as the US. Our results showed that preexposure to saccharin produced a retardation of subsequent conditioning in both animals that were hungry and thirsty prior to the conditioning trials. The implications of these findings for theories of the US preexposure effect that make predictions regarding the effects of motivational variables are discussed.

**PL-7**
**Title**: Do exist differences in latent inhibition between high and low drinkers in schedule induced polydipsia?
**Authors**: Navarro, S. V., Álvarez , R., Moreno, Gutiérrez-Ferre, V. E. & M., Flores, P.
**Affiliation**: University of Almería, Jaén
**Corresponding author email**: silviapsycho@hotmail.com
**Abstract**: In this study we analyze the relationship between two models of psychopathology: scheduled induced polydipsia as model of compulsive behavior (Moreno and Flores, 2012) and latent inhibition as model of schizophrenia (Alvarez, De la Casa y Sánchez, 2003). Specifically, our aim is to test if subjects already classified as high and low drinkers under schedule induced polydipsia procedure obtain different levels of latent inhibition with a conditioned suppression procedure. All the subjects were trained to press the lever, afterwards, half of each group were preexposed to a tone. In the final phase of the experiment, all the rats received 8 conditioning trials, where the tone was followed by a shock. This procedure permits to assess the adquisition course. In conclusions we discuss the results and relationships between selective attention and compulsive behavior and their possible implications.

## Time and Context (TC)

**TC-1**
**Title**: Contextual dependence of non-extinguished learning in rats appears when the extinction experience takes place within a different task
**Authors**: Rodolfo Bernal-Gamboa[1], Juan M. Rosas[2], & José E. Callejas-Aguilera[2]
**Affiliation**: [1]National Autonomous University of México, México; [2]University of Jaén, Spain
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**Abstract**: Two experiments with rats analyzed the effect of extinction on context-specificity of a new association learned within a different task. Each experiment involved four phases. For half of the subjects, conditioning and extinction was conducted in context A in Phases 1 and 2 within a specific task (running for water in a straight alley in Experiment 1a, and conditioned taste aversion in Experiment 1b), while the other half did not receive extinction. Phases 3 and 4 involved conditioning and testing of new events within the alternative task in contexts B and C, respectively (conditioned taste aversion in Experiment 1a, and running for water in a straight alley in Experiment 1b). When training in Task 1 involved extinction, performance with the non-extinguished event at testing in Task 2 was worse in context different than in the training context, while no differences were found when extinction was not conducted within the first task. These results are consistent with the idea that extinction prepares subjects to pay attention to contexts, regardless of whether contexts were involved in the original task or not.

**TC-2**
**Title**: An Extinction Cue fails to prevent ABA Renewal in Human Predictive Learning
**Authors**: Javier Bustamante Alvarez, Harald Lachnit & Metin Uengoer
**Affiliation**: Philipps-Universität Marburg, Germany
**Corresponding author email**: javier.bustamante@staff.uni-marburg.de
**Abstract**: An extinction cue is a novel cue presented during the extinction phase that according to the evidence is capable to prevent at least partially renewal and spontaneous recovery. An experiment investigated whether the inclusion of an extinction cue in the extinction phase in a predictive learning experiment using letters as cues and shapes as outcomes could prevent successfully ABA renewal. The results indicated that, although a renewal effect was found, the extinction cue had no effect on response recovery. Some explanations are discussed, including the particularities of the procedure in comparison with other investigations in both human and non-human animals.

**TC-3**
**Title**: Evaluation of the context-outcome association in the context switch effect in human instrumental conditioning using a transfer test
**Authors**: A. Matías Gámez, Samuel P. León & Juan M. Rosas
**Affiliation**: University of Jaén, Spain
**Corresponding author email**: amatiasgm@gmail.com
**Abstract**: Different studies on predictive learning in humans have shown an effect of context switch after simple acquisition as consequence of a direct association between the context and the consequence. However, this effect using an instrumental task in humans can only be explained by assuming a hierarchical association mechanism. An experiment aimed at evaluating the role of context-outcome association in the context switch effect in human instrumental learning, using a transfer test. Four instrumental responses were trained, so that R1 and R3 were followed by the

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consequence 1 and R2 and R4 by consequence 2. In a later phase of discrimination training, R3 was trained in the presence of X followed by a consequence in context A while Y was not followed by any consequence in this context. In context B, Z and J cues were not followed by any consequences. If during this training an association between context A and the consequence 1 has been established, and given that R1 and R3 share the same consequence, then a higher rate of R1 than R2 is expected in context A. However we find that in the context A the participants response more R2 than R1. Although the result is the opposite than expected, it is evidence of context-outcome association as a mechanism underlying the effect of context switching in human instrumental learning.

**TC-4**
**Title**: Lithium-induced context conditioning as measured by consumption and taste reactivity
**Authors**: Gasalla, P.; Soto, A; Tellander, S. & López, M.
**Affiliation**: University of Oviedo, Spain
**Corresponding author email**: patriciagasalla@gmail.com
**Abstract**: In each of two experiments with rats, we examined the effect of prior pairings of a distinctive context and injections of lithium chloride (LiCl) on the acquisition of a LiCl-induced saccharin aversion as measured by consumption and taste reactivity tests. In Experiment 2, rats were given an intraoral infusion of water prior to the LiCl injections in the distinctive context. During the conditioning trial, the rats were intraorally infused with saccharin in the context previously paired with the lithium or in the home cages. Control rats received an injection of saline during this session. On the taste reactivity test, the number of gaping made by the animals in the context and during an intraoral infusion of saccharin was measured. Consumption of saccharin in the home cage was finally measured. In both experiments, a context change between the preexposure and conditioning phases did not affect the number of gaping responses displayed by the rats during the infusion of saccharin and during the exposure to the context. However, when evaluated using the consumption test, the context change affected taste avoidance only when rats did not receive intraoral infusions of water during preexposure phase.

**TC-5**
**Title**: ABA and AAB renewal in discriminant operant procedure with rats.
**Authors**: Samuel P. León [1], Drina Vurvic [2], Travis Todd[2] & Mark E. Bouton [2]
**Affiliation**: [1] University of Jaén, Spain; [2] University of Vermont, USA
**Corresponding author email**: sparra@ujaen.es
**Abstract**: *Renewal* is considered when responding to a CS that has been through extinction returns when the CS is tested in a context that is different from the context in which extinction occurred. Several versions of the renewal effect have been studied. In the most common one, "ABA renewal," conditioning is conducted in one context (context A) and extinction is then conducted in a second one (context B). When the CS is returned to

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the original conditioning context (context A), responding to the CS returns. There are other forms of renewal. In ABC renewal, conditioning and extinction occur in contexts A and B and recovery is seen in context C. Finally, AAB renewal, both conditioning and extinction occur in context A, and recovery is seen in context B. Renewal effect has been amply demonstrated in Pavlovian learning, but there are doubts that operant behavior can also be renewed after extinction in the same way that it is found in Pavlovian learning. There are just a few reports of ABA renewal in discriminant operant learning, but more interesting many studies have failed to find AAB renewal. In the present work we will demonstrate ABA and AAB renewal in a discriminate operant procedure with rats.

**TC-6**

**Title**: Human ABA and AAB renewal in a predictive learning task.

**Authors**: Moreno-Fernández, M.M.; León, S.P.; Callejas-Aguilera, J.E., & Rosas, J.M.
**Affiliation**: University of Jaén, Spain
**Corresponding author email**: mmmoreno@ujaen.es

**Abstract**: Differences between AAB and ABA renewal on extinction and test have been usually reported in human and animal literature (e.g., Nelson, Sanjuan, Vadillo-Ruiz, Pérez y León, 2011; Rosas, García-Gutierrez & Callejas-Aguilera, 2007 ), and differences in learning mechanism underlying these effects proposed as a possible explanation for them. An experiment was carried out with the main goal of exploring AAB and ABA renewal in humans using a predictive learning task. Results showed a similar AAB and ABA renewal on test but differences in extinction were found between groups. A context switch effect after acquisition was found along the first trials of extinction in ABA group when compared with AAB, making extinction to progress faster in the former group. Even if renewal effect was similar for both groups, dissimilarities in extinction may be pointing towards differences in the mechanisms taking part on each procedure.

**TC-7**

**Title**: Extinction and within-session spontaneous recovery of incubated fear in a conditioned freezing preparation

**Authors**: Cristina Vargas-Irwin[1], Andrés M. Pérez-Acosta[2], Gladys S. Martínez[1]
**Affiliation**: [1]Centro de Investigaciones en Biomodelos, Colombia; [2]Universidad del Rosario, Colombia
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**Abstract**: One of the factors determining treatment effectiveness in Posttraumatic Stress Disorder (PTSD) is the interval between the exposure to the traumatic event and treatment. The increase in conditioned fear with the mere passage of time has been well documented, and is referred to as fear incubation. Our aim was to systematically explore the effects of extinction on incubated fear. Three groups of male ICR mice (Jackson, Laboratories) were exposed to a fear conditioning session, where a 20 s. white noise co-terminated with a 1 s. 0.7 m.A. scrambled shock. Three of these

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trials were administered during this acquisition session. All animals were subject to behavioral extinction 1, 5 or 11 days after conditioning, which consisted of 40 non-reinforced presentations of the white noise. Freezing to the CS was automatically recorded for all animals throughout the experiment. Results indicated that incubated fear was more resistant to extinction, but less susceptible to short-term spontaneous recovery than fear extinguished closer in time to conditioning.

**TC-8**
**Title**: Generalization and spontaneous recovery of incubated fear in a conditioned freezing preparation
**Authors**: Cristina Vargas-Irwin[1], Andrés M. Pérez-Acosta[2], Gladys S. Martínez[1]
**Affiliation**: [1]Centro de Investigaciones en Biomodelos, Colombia; [2]Universidad del Rosario, Colombia
**Corresponding author email**: amperezacosta@gmail.com
**Abstract**: The increase in conditioned fear with the mere passage of time has been well documented, and is referred to as fear incubation. Our aim was to explore the associative nature of incubated fear, as well as its spontaneous recovery and generalization to a new context.
Three groups of male ICR mice (Jackson, Laboratories) were exposed to a fear conditioning session, while a forth group of mice was trained with un-paired presentations of both the CS and US. One of the conditioning groups (Inc 1 day) and the sensitization group received an extinction session on the day following conditioning. The second conditioning group was exposed to the extinction procedure 3 days after conditioning (3 day Inc Group), while the third conditioning group received no extinction training and remained in their home cages (Forgetting Group). On the fourth day after conditioning, all groups received a testing session in a new context, whre all animals were exposed to unreinforced presentations of the CS and to a new stimulus. Results indicated that generalized freezing was significantly different across groups ($F_{3,37}=3.61$, $p=0.022$), with the Forgetting group exhibiting significantly higher generalized fear than either the 3 Day Incubation or the Sensitization groups .

## Discrimination, Attention, and Consciousness (DAC)

**DAC-1**
**Title**: Limitations of the oblique effect in pigeons
**Authors**: Francisco J. Donis, Michael Moffitt, & Jazmine Nava
**Affiliation**: Central Connecticut State University, USA
**Corresponding author email**: donis@ccsu.edu
**Abstract**: Donis (1999) found that it is easier for pigeons to discriminate between two lines in the main axes orientation than between two obliquely oriented lines. This so called Oblique effect was obtained with stimuli consisting of full lines and also with dotted-lines made up of 3 dots with a separation between dots of 2 mm (i.e., Experiment 3). Donis, Moni, & Hale

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(2010) replicated Experiment 3 with the only difference that each of the stimuli was made up of only 2 dots with a separation of 6 mm. Unlike the results of Experiment 3, independent t-tests yielded no significant differences for either proportion correct or reaction time data ($p > .05$). One possible explanation may be that the separation between the 2 dots was too large (6 mm); therefore, in the present experiment the separation between the 2 dots was only 2 mm, as in Experiment 3 in the Donis' study (1999). Proportion correct and reaction time data were in the expected direction but failed to reach significant levels ($p > .05$). These results suggest that the oblique effect in pigeons has some limitations and may depend on line-stimuli made up of at least 3 dots with a separation of 2 mm.

**DAC-2**
**Title**: The Long + Effect as Demonstrated by Humans Playing a Video Game
**Authors**: Suzette L. Astley & Mark E. Bouton
**Affiliation**: Cornell College & the University of Vermont, USA
**Corresponding author email**: sastley@cornellcollege.edu
**Abstract**: The Bouton laboratory has demonstrated that rat subjects learn a Pavlovian discrimination more readily when a long rather than a short cue differentially predicts US occurrence. The present study demonstrates this effect in humans. Participants played a video game in which the appearance of an enemy alien (US) from behind a cloaking device (CS) was predicted by either a 1" or a 4" ITI. Participants got points by pressing the spacebar during the CS on reinforced trials and lost points by pressing the spacebar during the CS on nonreinforced trials. In the Long + condition, the 4" ITI preceded reinforced trials, and in the Short + condition the 1" ITI did. The control was a Pseudodiscrimination condition, in which reinforced trials were equally often preceded by the 1" and the 4" ITI. Only the participants in the Long + condition pressed the spacebar significantly more often on reinforced than on nonreinforced trials. In addition, Long + participants earned significantly more points than did either the Short + or the Pseudodiscrimination participants. Thus, the Long + effect is a relatively general phenomenon that may be related to mechanisms of processing temporal information that are shared by humans and laboratory rats.

**DAC-3**
**Title**: The use of continuous variables by angelfish (Pterophyllum scalare) in a quantity discrimination task
**Authors**: Luis M. Gómez Laplaza
**Affiliation**: University of Oviedo, Spain
**Corresponding author email**: lmgomez@uniovi.es
**Abstract**: Previous studies investigating quantity discrimination showed that angelfish (Pterophyllum scalare) are able to select the larger of two groups of conspecifics (shoals). The results suggested the existence, as also found in higher order vertebrates, of two quantification systems: one for approximately estimating large quantities (≥ 4), and the other for precisely discriminating small

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quantities (< 4). However, in these studies no attempt was made to control for non-numerical features of the stimulus shoals. The aim of the present study was to determine whether angelfish can discriminate between shoals differing in numerical size using non-numerical attributes. Here, density and inter-fish distance of the shoals was systematically manipulated and the choice made by angelfish between the contrasting stimulus shoals was analyzed. The stimulus shoals were constituted by both large (10 vs. 5) and small (3 vs. 2) number of conspecifics. Results suggest that angelfish based their shoaling decisions upon density of the shoals when large shoals were contrasted: the test subjects preferred the more dense shoals. Manipulation of inter-fish distance of the contrasting shoals revealed that this factor did not play a significant role in the fish's preference either when large or when small shoals were contrasted. Sensitivity to the density only in case of large shoals demonstrates that angelfish can estimate shoal size using this non-numerical cue, which supports prior findings of approximate estimation method employed for the comparison of large shoals in angelfish. Differences in the results with large and small shoals also support the existence of the two functionally distinct cognitive quantification systems in this species.

**DAC-4**
**Title**: The role of external feedback in visual easy-to-hard effect.
**Authors**: Moreno-Fernández, M. M.; León, S., P. & Rosas, J. M.
**Affiliation**: University of Jaén, Spain
**Corresponding author email**: mmmoreno@ujaen.es
**Abstract**: Training with an easy version of a discrimination task usually facilitates subsequent learning on a more difficult task involving stimuli that vary along the same dimension. This effect is known as the easy-to-hard effect and has been usually reported in discrimination tasks in which explicit feedback is provided. An experiment was carried out to explore the role of external feedback in human visual easy-to-hard effect. Two easy-to-hard groups (ETH) were trained under a progressively harder schedule in which discrimination was gradually increased, while two hard-to-hard (HTH) groups were trained under a high and constant level of difficulty. External feedback along training phase was also manipulated, so that one ETH and one HTH group received feedback whereas the other two groups did not. Results showed that easy to hard effect can be found even when no external feedback is provided along the training phase.

**DAC-5**
**Title**: Methodological improvements in the conscious will clock paradigm: larger action-effect intervals and different assessment questions
**Authors**: Pablo Garaizar, Carmelo P. Cubillas & Helena Matute
**Affiliation**: University of Deusto, Spain
**Corresponding author email**: carmelo.perez@deusto.es
**Abstract**: Libet described a paradigm for studying conscious will using a clock face with an inner rotary spot. The participants were asked to press a button

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at any moment and then to mark where was the spot when they decided to act. Banks and Isham added a tone after the participant´s response and found that has an influence in participant´s judgments. Although many studies in this area have followed this paradigm, there are some methodological issues related with it. Firstly, the action-effect intervals are too short to be presented and discriminated accurately using general purpose hardware (i.e., 5-60 ms.) Secondly, the number of participants of previous experiments is remarkably low (i.e., N<10). Therefore, we conducted four experiments with longer intervals and N>40. In the first experiment we increased the action-effect interval to 500 ms. The second experiment replicated these results with an action-effect interval of 1000 ms. Finally, we replicated the first two experiments to avoid the possibility of participants' misunderstanding of the task, asking them to report the moment of their response. We show that Banks and Isham´s effect can be found using larger action-effect intervals and both kinds of judgments. These findings facilitate future studies on conscious will.

**DAC-6**
**Title**: The eyes have it!! Stroop spatial interference with real but not with schematic gazes
**Authors**: Colmenero, J. Mª, Ortega, A. R., Ramírez, E., García-Viedma, R., & Montes, R.
**Affiliation**: University of Jaen, Spain
**Corresponding author email**: jjimenez@ujaen.es
**Abstract**: Recent work (Cañadas, & Lupiañez, in press) has found a reverse congruency effect when the directional target is a gaze but not when it is a less "realistic" stimulus (e.g. a pair of triangles). Here two experiments are reported in which participants are asked to indicate the direction signaled by a target consisting of a pair of arrows, a directional word ("right" or "left") or a gaze. In experiment 1 we employed a real gaze whereas in experiment 2 it was replaced by a schematic one. In both experiments, location and direction signaled by the target could be congruent (i.e. a photo of two real right-gazing eyes appearing right on the screen) or incongruent (i.e. the word "left" appearing on the right). Results showed significant effects of target, type of gaze, congruency and a 3-way interaction of the three factors. Thus, RT were slower in congruent than in incongruent trials (reverse congruency effect) only when target was a real gaze. This result shows close links between the reverse congruency effect, the social meaning of the gaze and its ecological validity, as well as the "special" status of gaze to signaling directions.

## Social Learning (SL)

**SL-1**
**Title**: Habituation of the sexual response in Japanese quail
**Authors**: Juan Carlos Riveros, Andrés Ballesteros, Germán Gutiérrez
**Affiliation**: Universidad Nacional de Colombia, Colombia

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**Corresponding author email**: gagutierrezd@gmail.com
**Abstract**: The purpose of this study was to document habituation characteristics of the sexual response in male quail. In the first experiment we exposed male quail to repeated five-minute female visual presentations (2 min ITI), and observed changes in the approach response to the female across trials. All subjects showed a decrease in approach which was interpreted as habituation. In the second experiment we compared two groups in their sexual habituation response. One of the groups (Spaced) was exposed to 30 five-minute visual presentations of a female (ITI=2 mins), whereas the other group (Continuous) was exposed to a single 150-minute visual presentation of a female, equating the time of exposure between the groups. Although both groups showed a decrease in their approach response to the female, no differences were observed between the groups. A discussion on the direction of these results is presented and further experiments are suggested.

**SL-2**

**Title**: "Inferring reputation" from third-party interactions in domestic dogs (Canis familiaris)

**Authors**: Mariana Bentosela[1] , Esteban Freidin[2], & Alba E. Mustaca[1]
**Affiliation**: [1]Instituto de Investigaciones Medicas "Alfredo Lanari", CONICET, Argentina; [2]Centro de Recursos Naturales Renovables de la Zona Semi-Arida, CONICET, Argentina
**Corresponding author email**: efreidin@criba.edu.ar
**Abstract**: Dogs can develop a preference towards a generous (someone who gives food) over an ungenerous (someone who doesn't give food) person after observing the interaction between both target persons and a third individual (the demander). In the present study, we assessed whether dogs could develop a preference between two target persons after the demander reacted either positively or negatively to the targets. Each subject watched while the demander asked the targets for food. Targets always responded by providing food to the demander. Upon receiving food from target+, the demander reacted by saying "So tasty!" and eating the food while oriented towards target+. Upon receiving food from target-, the demander reacted by putting the food back in the target's plate, saying "So ugly!", and turning around, giving his back to target-. Preliminary results suggest that, after demander-target interactions, observing dogs preferentially approached target+ over target-. However, many dogs did not pay attention to the scene and did not choose between targets. According to these results, attentive dogs would be able not only to discriminate between the different reactions of the demander, but also to associate a different valence to the targets as a function of the demander's reactions.

**SL-3**

**Title**: Social hierarchy, learning, and sexual selection in Coturnix japonica

**Authors**: Germán Gutiérrez, Bibiana Montoya & Laura Suárez
**Affiliation**: Universidad Nacional de Colombia , Colombia

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**Abstract**: The effect of learning in male-male competition in the context of sexual selection in Japanese quail (Coturnix japonica) was evaluated. Groups of three males were observed for 40 days, testing the relationship between copulatory efficiency and winner-loser status. A positive association between copulatory efficiency and the winner status was observed. The next question was whether learning could improve the copulatory efficiency for the looser males. The looser males were classically conditioned for 10 days and then they were tested in a competition with the other two males of the original group for copulatory access to a receptive female. When the CS was present in the test, the conditioned male (looser) copulated first with the female and his copulatory efficiency did not show any difference with the other two males' indexes. These results provide further evidence on the adaptive value of learning and an improvement of the opportunity for fertilization in males that previously had been lowest in the social hierarchy of each group.

**SL-4**

**Title**: Social Enrichment Affects Suboptimal, Risky, Gambling-Like Choice by Pigeons

**Authors**: Jennifer R. Laude, Kristina F. Pattison, & Thomas R. Zentall
**Affiliation**: University of Kentucky, USA
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**Abstract**: We have found that pigeons will choose a suboptimal reinforcement alternative that provides 50% reinforcement, if reinforcement is signaled, over an alternative that provides 75% reinforcement, if reinforcement is unsignaled. This finding is analogous to suboptimal human monetary gambling because in both cases there appears to be an overemphasis of the occurrence of the winning event (signaled reinforcement) and an underemphasis of the losing event (signaled nonreinforcement). However, in the present research we found that pigeons that were exposed to a socially enriched environment (a large cage with three other pigeons for 4 hr a day) were less likely to show this suboptimal choice behavior compared with typically housed pigeons in a control group. These results indicate that social enrichment can influence the development of conditioned reinforcers and conditioned inhibitors and they have implications for the mechanisms underlying suboptimal choice by humans (e.g., problem gamblers).

**SL-5**

**Title**: Social interaction and conditional self-discrimination under effects of methylphenidate in norvegicus rats

**Authors**: Julio C. Penagos Corzo[1], Cristina Hermosillo[1], & Andrés M. Pérez-Acosta[2]
**Affiliation**: [1]Universidad de las Américas, México; [2]Universidad del Rosario, Colombia
**Corresponding author email**: amperezacosta@gmail.com

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**Abstract**: Conditional self-discrimination capability was studied in 24rattus norvegicus four weeks old, they were assigned to three different conditions of social interaction (isolation, living in pairs, and groups of four subjects). Subjects were trained under two programs of operant conditioning, each one associated with presence or absence of methylphenidate. The dependent variable was measured during the phase of extinction. Significant differences were found for self-discrimination capacity, but not in relation to social interaction. It is possible to conclude that rattus norvegicus are able to discriminate their internal state, and learn to use this state as a discriminative stimulus. Despite the lack of significant differences in social interaction, the trends of the observed data from a qualitative point of view, suggest the possibility of interaction between the variables studied.

**SL-6**

**Title**: Do dogs discriminate between pro-social and anti-social human behavior?

**Authors**: Trojan, Maciej[1], Reinholz-Trojan, Anna[1], Włodarczyk, Ewelina[2]
**Affiliation**: [1]University of Warsaw, Poland; [2]Interdisciplinary Center for Ethology and Animal Psychology, Poland
**Corresponding author email**: maciej@psych.uw.edu.pl

**Abstract**: The aim of this study was to examine whether dogs discriminate between egoistic and altruistic human behaviors. The experiment was conducted on 32 dogs of both sexes. Each dog observed three persons who were dressed identically and were seated in a row, 5 meters away from the dog, 1 meter away from each other. Each person was holding a bowl containing food. Their gaze was directed towards the floor to avoid eye-contact with the dog. Each person was asked to behave in a certain consistent manner towards the fourth person who was approaching each of them soliciting food. One person always shared food (the altruist), the second person responded randomly (ambivalent) and the third person always refused (the egoist). The begging person approached each of the three sitting persons three times and then left the room. The handler released the dog which could then approach any of the three seated persons. For each dog, such trials were performed three times, so that the seated persons would relocate to sit in a different order. Results revealed that dogs attempted to solicit food from the egoist significantly less frequently than from the other two persons, as examined both for the results of the dogs' first choice (chi-square=8,31, df=2, p=0,016) and for all three decisions (chi-square=9,929, df=2, p=0,07). There was no difference in the preference for altruists or persons behaving in the ambivalent way. This result indicates that dogs tend to remember egoists, while the predictability of pro-social behavior is not of major importance to them.

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## POSTERS SESSION II

## Neurobiological Basis of Behavior (NBB)

**NBB-1**
**Title**: Study of acute and chronic anxiogenic effect of yohimbine in Wistar rats
**Authors**: M. L. de la Torre, E. Alegre, I. Plazuelo, V. Romero, M.D. Escarabajal, & A. Agüero
**Affiliation**: University of Jaén, Spain
**Corresponding author email**: mltorre@ujaen.es
**Abstract**: Although there is a generalized agreement on the anxiogenic effect of yohimbine, we consider necessary to study, not only the acute effect of the dose of the drug selected (based on the literature on the subject), under our own experimental conditions, but also to evaluate the extent to which this effect is reduced by repeated exposure to the drug, given that this drug will be used, both acutely and chronically, in future experiments to be conducted in our laboratory, with the aim of induce a state of stress and / or anxiety in the subjects (rats). Concretely, this study aimed to evaluate the acute anxiogenic effectiveness of a dose of 2.5mg/kg of yohimbine and the anxiogenic effectiveness of the same dose after repeated administration of it, employing an animal model of anxiety highly contrasted such as the elevated plus maze. The results obtained indicate the absence of an acute and / or chronic anxiogenic effect of the drug on exploratory behavior of animals in the elevated plus maze, with the dose administered and the experimental procedure employed. Given these results and, after a further review of the literature on the subject, we have proceeded to design a new experiment, to be developed in the near future in our laboratory, which will attempt to reduce the initial level of anxiety of animals by a period of manipulation (handling) prior to exposure to the plus maze, and therefore, a higher dose of yohimbine will be used (3 mg / kg).

**NBB-2**
**Title**: Influence of sex, time in safety and psychogenetic selection in one-way avoidance learning
**Authors**: Donaire, R.[1], Sabariego, M.[1], Gómez, M.J.[1], Fernández-Teruel, A.[2], & Torres, C.[1]
**Affiliation**: [1] University of Jaén, Spain; [2]Autonomous University of Barcelona, Spain
**Corresponding author email**: rdcortes84@gmail.com
**Abstract**: The inbred Roman High- (RHA-I) and Low- (RLA-I) Avoidance rats were selected, respectively, for rapid vs. poor acquisition of two-way active avoidance, these behavioral differences being influenced by sex and early and late environmental influences. In this study male and female RHA-I and RLA-I rats were exposed to a one-way avoidance task in which

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the time spent in the safe compartment was manipulated in two phases. Animals received a tone (88 dB) followed by an electric foot shock (1 mA) in the danger compartment (in the safe compartment these stimuli never appear). In preshift phase animals were exposed to 30 s vs. 1 s in safety. In postshift phase this time remained constant for groups 30-30 and 1-1, whereas it was devaluated for groups 30-1 (successive negative contrast, SNC). Trials to preshift and postshift criteria were used as dependent variables. The results showed that, in preshift phase, strain differences were observed only female rats, the RLA-I strain being worse than the RHA-I strain. In postshift phase, a SNC effect was observed only in female rats, and only in RLA-I, showing that an interaction among genes, sex and time in safety influence one-way avoidance behavior.

**NBB-3**
**Title**: Propranolol´s role in reward´s memory impairment
**Authors**: Eliana Ruetti[1], Nadia Justel[1], Mariana Psyrdellis[1], Esteban Freidin[1], Mariano Boccia[2], & Alba Mustaca[1]
**Affiliation**: [1]UBA-CONICET, Argentina; [2]UBA, Argentina.
**Corresponding author email**: efreidin@yahoo.com
**Abstract**: The animal´s behaviour depends on their previous experience with rewards of different incentive value. Blockade of ß-adrenergic receptors leads to a decrement in several task´s memory. The aim of this study was to evaluate the administration´s effect of a ß-adrenergic antagonist on a reward´s downshift memory. The animals receive 10 o 2 trials (Experiment 1 or 2) with the high incentive reward (32% sucrose solution) and then they were expose to a low incentive reward (4% sucrose solution). Propranolol was administered immediately after the first trial with the low incentive reward. The consummatory intake was evaluated 24h, 48h and 72h thereafter. When the subjects had 10 trials with the high incentive reward it was found that post-training administration of propranolol results in an enhancement of the consummatory response, suggesting the existence of memory impairment (Experiment 1). On the other hand, when the animals had only 2 trials with the high incentive reward, propranolol´s administration results in the suppression of the consummatory response during the test (Experiment 2).These data suggest that propranolol modulates memory of the downshift reward in an opposite way depending of the previous experience with the reward.

**NBB-4**
**Title**: Thalamic taste area Fos-like immunoreactivity during taste-recognition memory in amygdala lesioned rats.
**Authors**: Morillas, E., Gómez-Chacón, B, Gámiz, F., & Gallo, M.
**Affiliation**: University of Granada, Spain
**Corresponding author email**: kikesic@correo.ugr.es
**Abstract**: Previous lesion studies have indicated the involvement of basolateral amygdala (BLA) and taste thalamic relays in taste recogniting

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memory. In order to investigate the potential relevance of BLA integrity on gustatory thalamus taste processing, bilateral excitotoxic BLA lesions by NMDA were combined with Fos-like immunohistochemistry as an index of neural activity. Male lesioned and sham-lesioned Wistar rats received two consecutive exposures to a neophobic (3%) cider vinegar solution. The number of Fos-like positive cells in the parvocellular ventral posteriormedial nucleus of the thalamus (VPMpc) was examined both in lesioned and sham-lesioned brains. The results showed that drinking a familiar taste solution induced a higher Fos-like immunoreactivity (FLI) in VPMpc than drinking a novel taste solution, while no differences were seen in other thalamic relay nuclei. Moreover, BLA lesions that disrupted habituation of taste neophobia interfered with such familiarity-related FLI increase. Thereafter, the results indicated an involvement of both VPMpc and BLA in a taste recognition memory neural circuit, thus support a potential role of descendent feedback pathways in processing taste familiarity.
Grants PSI2008-03933, PSIC2011-23702 (MICINN. Spain) and HUM02763 (Junta de Andalucía. Spain) both supported by FEDER funding.

**NBB-5**

**Title**: Hippocampal gene expression after a frustrating experience of reward devaluation in inbred Roman High- (RHA-I) and Low- (RLA-I) Avoidance rats.

**Authors**: M. Sabariego [1], R. Donaire [1], M. J. Gómez [1], A. Fernández-Teruel [2], I. Morón [3], F. Esteban [1], J.A. Conejero [4], & C. Torres [1]
**Affiliation**: [1] University of Jaén, Spain; [2]Autonomous University of Barcelona, Spain; [3]University of Granada, Spain; [4] iGenomix, Spain
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**Abstract**: To identify genes involved in frustration responses, we analyzed the differential gene expression profiles in the hippocampus of psychogenetically selected rats which differ in anxiety/stress responses: the inbred Roman High- RHA-I and Low- RLA- I Avoidance rats. Frustration was induced by exposing food-deprived rats to the sudden reduction in the amount of solid food presented in the goal of a straight alley (from 12 pellets to 2 pellets; instrumental successive negative contrast- iSNC-). iSNC effect appeared only in the more emotional RLA- I rats, supporting those theories that account for this effect on the basis of emotional mechanisms. Ten genes were obtained as differentially up-regulated in RLA-I as compared to RHA-I rats. Six of these genes related to neurobiological processes and behavior were selected for microarray validation. Five of them were validated (TAAR2, THAP1, PKD2LD, NANOS1, PSOR1), these genes being linked to neuropsychiatric disorders (schizophrenia), monoaminergic regulation, vulnerability to drug abuse, dystonia, taste sour and development of the nervous system. These results support the usefulness of these strains of rats for neurogenetic research of anxiety/frustration- related behavioral traits.

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**NBB-6**
**Title**: Modulation of spine density by schedule-induced polydipsia in anterior prefrontal cortex neurons
**Authors**: Estrella Soria[1], Javier Íbias[1], Asta Kastanauskaite[2], Úrsula Morillo[1], Cristina Orgaz[1], Javier DeFelipe[2,3], Ricardo Pellón[1], & Miguel Miguéns[1].
**Affiliation**: [1]National University of Distance Education, Spain; [2]Polytechnic University of Madrid, Spain; [3]Cajal Institute, CSIC, Spain
**Corresponding author email**: estrella_soria@ono.com
**Abstract**: The excessiveness and persistence of drinking behavior evidenced in schedule-induced polydipsia (SIP) has led to propose this task as a successful model to study the development of compulsive behavior disorders. Some authors have implicated the cortico-striato-thalamo-cortical circuits in interval timing behaviour. As SIP is dependent of the fixed interval length, in the present experiment we examined whether performance a SIP procedure would induce modifications in cortical and striatal areas, as revealed by differences in neuron morphology and spine density. Specifically, the effects of 20 sessions of SIP on the structure, size and branching complexity of the basal dendrites, and spine density were determined in the basal dendritic arbors of layer III pyramidal neurons in the anterior prefrontal cortex (APf). Similar parameters in the dorsal striatum neurons were also studied. We found that rats following the SIP procedure showed increased spine density in the APf compared to control rats. The present work demonstrates that changes in brain morphology at the APf could be involved in the development of SIP. These results could improve the knowledge about the neurobiological mechanisms that could be involved in compulsivity spectrum disorders.

**NBB-7**
**Title**: Hemispheric Specialization in Dogs for Processing of Acoustic Stimuli
**Authors**: Trojan, Maciej [1], Reinholz-Trojan, Anna[1], Włodarczyk, Ewelina[2], Stefańska, Joanna[3], & Piwko, Katarzyna[1]
**Affiliation**: [1] University of Warsaw, Poland; [2] Interdisciplinary Center for Ethology and Animal Psychology, Poland; [3] ALTO - Center for Dog Education, Poland
**Corresponding author email**: maciej@psych.uw.edu.pl
**Abstract**: Being widely spread among various species lateralization focuses the scientists' attention. Generally, the left hemisphere is thought to process familiar or learned stimuli, moreover, it plays a role in communication. Conversely, the right hemisphere works on new and emotional information. There is little data considering the lateralization in Canis familiaris so far. The aim of our research was to check the dog's reaction to diverse acoustic stimuli. The group of 50 animals were given 4 different sounds from the loud speaker behind their heads. The acoustic stimuli differed in character were: the dog's barking, the cat's miaowing, the human orders 'sit' and 'wir' (meaning: whirl). The last command was

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supposed to be control stimulus as it should be meaningless for the dogs. Each dog was presented each stimuli only once. The orienting reaction together with the direction of the dog's head movement was recorded. 91% of the dogs reacted to the barking, 100% to the miaowing and 78% to the command 'sit', while only 43% did react to the control order 'wir'. The rotation of the dog's heads only partly agreed with our expectations. While the dogs statistically most often rotated their heads left to the barking (chi-square=4,67, df=1, p=0,031) and the miaowing (chi-square=5,57, df=1, p=0,018), they haphazardly listened to the orders 'sit' (chi-square=2,79, df=1, p=0,096) and 'wir' (chi-square=1,8, df=1, p=0,18). The dominance of left ear during the perception of the barking and the miaowing can be easily explained through the evoking of emotions by such stimuli. However, it was expected that the command 'sit' in contrary to 'wir' would activate the left hemisphere. Although, some of the dogs were obedient to the order 'sit', the research did not show the dominance of left hemisphere. It seems to be necessary to continue the research on the reaction to the stimuli with the different values in Canis familiaris.

**NBB-8**

**Title**: Neuronal representation of 3d characteristics of the environment in the hippocampal system of the rat

**Authors**: J.P. Vargas, M. Bovet, M. Portavella, & J.C. López

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**Abstract**: Hippocampal place cells have been extensively studied in two-dimensional environments. The contributions of these studies to our knowledge about the representation of the memory in the brain have been considerable. Nevertheless, recent studies have shown that place cells could codify also three-dimensional space. Also, the discovery of a topographically organized neural map of the spatial environment in the medial entorhinal cortex that has been basically described in two-dimensional environment open up the questions about how the hippocampal system encodes three-dimensional space information. We trained rats in different environments with distinct three-dimensional features to analyze the response of the hippocampal place cells to the vertical component of the space. We record neuronal signals while the rats were exploring either an open-field or a linear track with irregularities in the vertical component. The results of the present study suggest that the hippocampal place-cells of the rat don´t encode the space in a three-dimensional fashion but instead the more prominent characteristic of the environment modify the place fields of these neurons. (This study was supported by PSI2009-12761 and RyC2006/1284).

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## Motivation, Reinforcement, and Behavior (MRB)

**MRB-1**
**Title**: Behavioral supports: A Comparative Analysis
**Authors**: Felipe Cabrera, Ángel Jiménez & Pablo Covarrubias
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**Abstract**: The organism-environment relationship is a fundamental unit of analysis for any behavioral description in psychology. Such a relationship has been described as reciprocal by the ecological approach to perception (Gibson, 1979), and entailed the concept of 'affordance'; that is, what the environment provides as a reliable support for a particular behavior to an organism. Although compatible with a behaviorist viewpoint, affordance perception has not been considered into the analysis of behavior domain. This presentation proposes a comparative analysis of affordance perception employing the intrinsic metric analysis (Warren, 1984) in order to facilitate generalization between the experimental analyses of behavior's findings and the perception-action approach. Our results and discussion suggested that the concept of affordance perception is valuable to account for the operant-level performance in typical operant procedures.

**MRB-2**
**Title**: Effort discounting in humans
**Authors**: Inês Fortes & Armando Machado
**Affiliation**: University of Minho, Portugal
**Corresponding author email**: ines.fortes@gmail.com
**Abstract**: The majority of research on discounting has examined how the value of a reward is influenced by its delay (temporal discounting) or its probability (probability discounting). However, although effort is usually required to receive a reward on a natural context, effort discounting has received less attention inside the laboratory. In this study we examined how students devalued a reward as the effort to receive it increased, using the adjusting amount procedure. Students chose between two options: a small reward delivered after no effort and a larger reward delivered after different degrees of effort. The effortful task consisted in pressing a button repeatedly and effort was manipulated by varying the response rate required. For each degree of effort, the small reward amount increased or decreased until the two options were equally chosen. The procedure was repeated with another fixed large amount, in order to verify a magnitude effect. With this study we attempted to understand how effort affects the value of a reward, allowing the determination of discounting functions for different reward amounts. The results were interpreted based on the current discounting models.

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**MRB-3**
**Title**: Self-control with negative punishment in pigeons
**Authors**: Pérez, V., Polín, E., Carrero, C., Moreno, T., & Vicente, M. S.
**Affiliation**: National University of Distance Education, Spain
**Corresponding author email**: labo.edu@gmail.com
**Abstract**: An experiment was designed in order to analyze the behavior of the subjects in a situacion in which both negative punishment´s delay and magnitude were manipulated. Choice between two alternatives allowed to distinguish the response as self-controlled (smaller magnitude of punishment and less delay), or impulsive (bigger magnitude and more delay). The experiment was developed using four pigeons and four Skinner boxes with two active keys. After self-shaping the response to both keys (left and right), all the subjects were exposed to blocks of three training sessions and one assessment session. During training sessions, subjects were exposed to one of the two components for each trial, while during assessment sessions both components were presented simultaneously. Components of the first five blocks consisted of 5" access to the feeder and 50" time-out (impulsive option, green key), and 3" access to the feeder and 30" time-out (self-controlled option, red key). The five following blocks included a component of 5":50" (impulsive, orange) and 3":20"(self controlled, blue), and the last five blocks consisted of 5":50" (impulsive, purple) and 3":10" (self-controlled, yellow). The results are discussed using the matching law and the concurrent rate schedules maximization phenomenon as theoretical framework.

**MRB-4**
**Title**: Consummatory successive negative contrast in infant rats.
**Authors**: Andrea Suárez[1], Alba Mustaca[1], Ricardo Pautassi[2], Esteban Freidin[3], & Giselle Kamenetzky[1]
**Affiliation**: [1] University of Buenos Aires, Interamerican Open University, Argentina; [2] Instituto de Investigación Médica Mercedes y Martin Ferreyra CONICET, Argentina, National University of Córdoba, Argentina; [3] Centro Científico Tecnológico (CONICET – Bahía Blanca), Argentina.
**Corresponding author email**: efreidin@yahoo.com
**Abstract**: The paradoxical effects of reinforcement were assessed during early ontogeny with instrumental procedures. Instrumental successive negative contrast, assessed through a runway, had been found at 25-26 post natal day (PND). We evaluated consummatory successive negative contrast (cSNC) in 14-19 postnatal day-old pups. Animals were exposed to sucrose (12% or 2%, preshift phase). Three or 24 hours later (Experiments 1 and 2, respectively) rats received 2% sucrose (postshift phase). In both experiments the infants exhibited a magnitude of reinforcement acquisition effect. An abrupt decrease in sucrose intake was observed during the postshift. This phenomenon, indicative of consummatory successive negative contrast, was accompanied by an increase in aversive oroffacial responsiveness, probably reflecting an aversive hedonic processing of

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the 2% sucrose. We discuss the differences between processes involved in consummatory and instrumental procedures in the framework of Amsel's frustration theory and highlight this finding as probably the first evidence of cSNC in infant rats.

**MRB-5**
**Title**: Effects of motivational states on acquisition and extinction of conditioned flavor preference in rats.
**Authors**: Takahisa Masaki
**Affiliation**: Kwansei Gakuin University, Japan
**Corresponding author email**: masakit1979@kwansei.ac.jp
**Abstract**: When rats drink a compound solution of a flavor (e.g., almond essence) and sucrose, they acquire a preference for the flavored water. This phenomenon is called flavor preference conditioning. The acquired flavor preference is long-lasting even if the rats are exposed to the flavored water many times without sucrose, that is, the conditioned flavor preference is highly resistant to extinction. However, the recent studies showed that the flavor preference can be extinguished if the rats are hunger when conditioning or testing (e.g., Harris, Shand, Carroll, & Westbrook, 2004). These findings are explained by two types of associations: a flavor-calorie association and a flavor-taste association. The present study attempted to replicate these findings using similar procedures and investigated the conditions that facilitate extinction of conditioned flavor preference in the food-deprived rats. Results suggested that the conditioned flavor preference could extinguish when hungry rats strongly acquired the preference.

**MRB-6**
**Title**: Preference/avoidance for flavoured solutions signalling presence/absence of ethanol and alcohol deprivation effect using a voluntary-consumption paradigm in rats
**Authors**: Estefanía Orellana Barrera [1], Liz Gabriela Lesta [1], Paula Abate [1, 2], & Felisa González [3]
**Affiliation**: [1]National University of Córdoba, Argentina; [2]Instituto de Investigación Médica Mercedes y Martín Ferreyra (INIMEC-CONICET), Argentina; [3]University of Granada, Spain.
**Corresponding author email**: estefi_orellana@hotmail.com
**Abstract**: A group of male rats (PN28) with ad lib access to food and water was exposed on alternated days to two flavoured solutions sweetened with saccharine. One of them was paired with an ethanol solution (CS+) whereas the other not (CS-). Ethanol (Et) concentration increased progressively from 2.5% to 10%, whereas saccharine concentration was progressively reduced from 0.6% to 0.1%. The amount of EC- provided was yoked to the consumption of Et+CS+; however, animals did not consume all the solution, showing CS- avoidance. Preference for the CS+ over water was also significantly higher than that for the CS- during training. Moreover, consumption of the Et+CS+ solution, but not of the CS-, increased after a

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brief period without exposure to ethanol. This result suggests an alcohol deprivation effect, usually considered as an index of abstinence development. Nevertheless evidence for preference for the CS+ over the CS- was inconclusive in a first set of tests; therefore the concentration of the CSs flavours was increased to compensate for possible generalization decrement. The results are discussed in terms of the pharmacological and calorific effects of ethanol. Funding: PSI2009-10627 (MICINN, Spain); 05/P120 (SECyT-UNC, Argentina) & PIP 0923 (CONICET, Argentina).

**MRB-7**
**Title**: Successive negative contrast and stress hormone levels in rats
**Authors**: Marta Sabariego[1], Rocío Donaire[1], Humberto Gagliano[2], Mª José Gómez[1], Ignacio Morón[3], Inmaculada Márquez[1], Bernabé Gómez[1], Francisco Javier Cano[1], Almudena Yébenes[1], Alberto Fernández-Teruel[2], Antonio Armario[2], Roser Nadal[2], & Carmen Torres[1]
**Affiliation**: [1] University of Jaén, Spain; [2]Autonomous University of Barcelona, Spain; [3] University of Granada, Spain
**Corresponding author email**: m.sabariegoalmazan@gmail.com
**Abstract**: Elevated pituitary-adrenal (PA) hormones (ACTH and corticosterone) are markers of emotional stress and have been observed in response to anxiety-inducing situations, including reward devaluation. Food-deprived Wistar rats were trained in a straight-alley in which they received a reward downshift (12-to-2 pellets per trial), upshift (2-to-12 pellets), or no changes in reward conditions (always 2 pellets or always 12 pellets). Response latency was the behavioral variable. Blood samples were collected from the rat's tail (a) during ad libitum food access; (b) after 7 days of food deprivation; (c) before a preshift session; (d) after a preshift session; and (e) after each postshift session. Plasma levels of ACTH and Corticosterone were measured by radioimmunoassay. Group 12-2 showed higher response latency than the other groups in the postshift phase, showing the successive negative contrast effect. Whereas ACTH did not change during reward devaluation, negative contrast was accompanied by an increase in corticosterone in Group 12-2 relative to the other groups. These results suggest a differential time-course for the two PA hormones or an ACTH-independent regulation of corticosterone synthesis associated to an experience of reward devaluation in an instrumental situation. The extent to which this response differs from other stress states requires further studies.

## Associative Learning (AL)

**AL-1**
**Title:** Overshadowing of non-geometrical cues in spatial learning with human participants
**Authors:** Alberto Monroy, David Luna, Javier Vila, & Angélica Alvarado
**Affiliation:** National Autonomous University of México, México

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**Abstract:** The learning of a stimulus is considered to be dependent on simultaneous cues, where occurs a competition between cues. One example is overshadowing, in which cue A acquires more associative strength than cue B when both of them are trained in compound. Traditionally in spatial learning, geometrical cues (GC) overshadowed non-geometrical cues (NGC) (Cheng & Newcombe, 2005). In two experiments, human participants learned to search one hidden area inside of a right triangle, where two cues of information were in competition; GC and NGC. The training consisted in eight trials where the triangle rotated and keep the goal in a constant relationship with the cues and finally, three test trials were presented, one with both cues other with GC and last with NGC. In the first experiment one group was trained with both cues, a second group only with GC and a last group with NGC. A second experiment changed the NGC salience. The results showed overshadowing of the GC over the NGC in humans and overshadowing attenuation by increasing the salience of the NGC. These results are in agreement with the predictions of Rescorla-Wagner's model.

**AL-2**

**Title:** Overshadowing of non-geometrical cues decrease after a retention interval

**Authors:** David Luna, Alberto Monroy Javier Vila, & Angélica Alvarado
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**Abstract:** In overshadowing when a CS X is presented in compound with a salient CS A this results in less CR. Although this result is considered as an acquisition deficit, there is evidence that explains it as a retrieval failure at the time of testing. In taste aversion, training with a compound CS and then interpose a retention interval before testing recovered the CR to the overshadowed stimulus (Matzel, Schachtman & Miller, 1988). However, at present this result has not been replicated. In an experiment using a virtual spatial learning task two groups of human participants learned the location of a hidden goal inside a triangle using geometric (GC) and non-geometric cues (NGC). Training consisted of eight trials and then there was a test with the overshadowed cue, in a group at 0h and another at 24h after training. The results showed a decrease in overshadowing of NGC after the retention interval. These data supports the idea that overshadowing is a retrieval failure effect than acquisition deficit.

**AL-3**

**Title:** The relevance of the within-compound associations in backward blocking: strengthening the within-compound associations through the insertion of training phases.

**Authors:** Amanda Flores[1], David Luque[1], & Miguel A. Vadillo[2]
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**Abstract:** Up to know, there is not clear evidence about whether retrospective reevaluation phenomena are produced mainly during learning or, on the other hand, during the testing phase. In the present causal-learning experiment, a phase of "within-compound training" was inserted to increase directly the strength of the within-compound associations through cue-cue trials. The moment in which the within-compound associations directly involved in retrospective reevaluation were strengthened, was manipulated between subjects. In Group 1-2, the revision of these associations was located between the two learning phases. In Group 2-Test, this training was located at the end of the Phase 2, just before the test. Backward blocking was obtained only in the 1-2 condition (supporting Dickinson, & Burke, 1996), and not in the phase of test (in contrast with the predictions of the comparator hypothesis).

**AL-4**
**Title:** Extinction of appetitive conditioning in Helix aspersa
**Authors:** Ana Fernández-Pérez, Ignacio Neis, Joaquín Morís, & David Luque
**Affiliation:** University of Málaga, Spain
**Corresponding author email:** nachoneis@gmail.com
**Abstract:** There are few demonstrations of associative learning phenomena in invertebrates using systematically a common paradigm and the same species. Moreover, even less of extinction of appetitive conditioning. Given the importance of this phenomenon, theoretically, evolutionary and physiologically, it is relevant to fill this gap. Tentacle lowering in Helix Aspersa has been used in recent studies to study many associative phenomena, both excitatory and inhibitory, of appetitive conditioning. We present two experiments that show that this phenomenon can be found reliably using this paradigm, extending the range of phenomena found in this species and procedure.

**AL-5**
**Title:** The S-O association after extinction in human instrumental conditioning.
**Authors:** A. Matías Gámez, Samuel P. León, & Juan M. Rosas
**Affiliation:** University of Jaén, Spain
**Corresponding author email:** amatiasgm@gmail.com
**Abstract:** The study of instrumental learning contents involves the evaluation of the associations that can be established in this learning situation, that is, binary associations S-O, R-O, and S-R, and the hierarchical association S-(R-O). Several works have shown these associations during instrumental acquisition, both in humans (e.g. Gámez & Rosas, 2007) and other animals (see Colwill, 1994). There is much less evidence in instrumental extinction case (Gámez & Rosas, 2005; Rescorla, 1993). In order to further the study of these associations status after extinction in human instrumental conditioning we have conducted two experiments. First, we design a

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task to get the acquisition of two instrumental responses, each of them in the presence of a discriminative stimulus (X-R1-O1; Y-R2-O2), and the subsequent extinction of one of them (e.g., X-R1-). In the second experiment we used a transfer test after the extinction of an instrumental response to test the preservation of S-O association through extinction. The results provide new evidence in the study of the associative structure of human instrumental extinction.

**AL-6**
**Title:** The associative nature of flavor-flavor learning using quinine as US
**Authors:** Sergio A. Recio, Marta Gil & Isabel de Brugada
**Affiliation:** University of Granada, Spain
**Corresponding author email:** sergio.recrod@gmail.com
**Abstract:** In two experiments with rats as subjects, we investigated the learning of conditioned flavor preference using quinine as the US, a flavour without post-oral nutritional consequences but with sensory properties (bitter taste). Quinine is a non-preferred flavor because of its bitter taste, so it is expected that pairing it with a neutral flavour will result in a decreased preference for that flavour. In Experiment 1, simultaneous pairing of a neutral taste (vanilla) with quinine resulted in a decrease in preference for that flavor compared with an unpaired control group. In order to test the possible associative nature of this kind of learning, we subsequently (post-conditioning) modified the value of quinine by pairing it with sucrose. The increased preference for vanilla shown in a subsequent test suggests that the learning of a flavor-taste relationship depends on an associative process. Experiment 2 was designed to study the effect of preexposure to quinine on subsequent conditioning. The results are discussed in terms of the mechanisms involved in the effect of preexposure, specifically when using a US that lacks post-oral consequences. Research funded by PSI2009-07513 (MEC) Project; P07-HUM-02763 (Junta de Andalucía) Project.

**AL-7**
**Title:** Odor preference and odor avoidance induced by amphetamine depending on the testing modality.
**Authors:** Revillo, D.A.[1], Fernandez, G.[1], Castello, S.[1], Paglini, M.G.[1], & Arias, C.[2]
**Affiliation:** [1]Instituto de Investigación Médica Mercedes y Martin Ferreyra, Argentina; [2]University of the Basque Country, Spain
**Corresponding author email:** damian_revillo@hotmail.com
**Abstract:** Psychostimulant drugs induce appetitive or aversive learning in rats. Their appetitive effects are more likely to become associated with contextual cues, while the aversive ones have been consistently found in taste aversion learning. To explain this paradox, it has been proposed that rats would avoid a taste that predicts a change in their homeostasis because this species cannot vomit. In this study we assessed the motivational properties of amphetamine by means of an odor conditioning preparation, which enables the analysis of the hedonic value of the memory by

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means of a consumption test or in terms of locomotor approach to the odor. Results indicate that regardless of the amphetamine dose (1 or 5 mg/kg), when animals were evaluated in the intake test, subjects avoided the odor. However, the outcome in the locomotor avoidance test varied as a function of the amphetamine dose. Rats trained with the low dose (1 mg/kg) showed odor preference, while the highest amphetamine dose (5 mg/kg) induced odor avoidance. When LiCl was employed as unconditioned stimulus, rats showed avoidance in the intake and locomotor activity tests. These data indicate that rats expressed conditioned odor avoidance or preference depending on the dose and testing modality. These results are relevant for current theories of avoidance learning induced by rewarding drugs.

**AL-8**
**Title:** An evaluation of taste palatability in flavor preference using the taste reactivity test
**Authors:** Soto A., Gasalla P., Bura S. & López M.
**Affiliation:** University of Oviedo, Spain
**Corresponding author email:** albertosotosanchez@hotmail.com
**Abstract:** The present study evaluated in rats whether the development of a conditioned flavor preference is accompanied by a shift in the hedonic evaluation or palatability of the flavor as assessed by the test reactivity (TR) test. More specifically, in two experiments rats exposed to a simultaneous compound of a moderately unpleasant taste (citric acid) and a pleasant taste (saccharin) subsequently showed an increase in the consumption of the citric acid compared to rats receiving the citric acid and the saccharin separately. However, this effect was abolished when the saccharin was devalued by pairings with lithium chloride (LiCl) following the conditioning phase. The TR test showed that rats exposed to the citric acid-saccharin compound displayed significantly less rejection responses (gapes, chin rubbing, forelimb flailing, and head shaking) to an intraoral infusion of the citric acid than the control rats, which never received the citric acid paired with the saccharin. The decrease in rejection reactions to the citric acid solution was not, however, accompanied by an increase in hedonic responses (mouth movements, tongue protrusions, and paw licking). The results are discussed in relation to the mechanisms underlying flavor preference conditioning.

**AL-9**
**Title:** Radial maze learning in tortoises (Agrionemys horsfieldii)
**Authors:** Tohru Taniuchi
**Affiliation:** Kanazawa University, Japan
**Corresponding author email:** tohruta@staff.kanazawa-u.ac.jp
**Abstract:** Two Central Asian tortoises (Agrionemys horsfieldii) were trained in an eight-arm radial maze equipped with rich extra-maze cues. Food rewards were 300 mg green vegetables and training was conducted one trial

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per day. After 80-140 trials of a free-choice task, tortoises learned to get about seven foods in the first eight choices, reliably above chance (5.3 correct choices). However, a strong tendency to select adjacent arms was developed. Such kinds of stereotypic response patterns enable animals to get food rewards without retention of visited arms in a working memory. Therefore, the training task was shifted to forced- and free-choice tasks where stereotypic response patterns could not contribute to correct performance. Tortoises showed performance in this task reliably above chance (50% for without replacement). An additional test suggested tortoises did not utilize visual or olfactory cues of food rewards. These results expand a cross-species generality of previous findings that showed radial maze learning by one red-footed tortoise (Wilkinson, Chan, & Hall, 2007; Wilkinson, Coward, & Hall, 2009), suggesting that tortoises have a working memory process which they utilize to guide complex spatial behavior.

## Extensions and Applications of Learning (EAL)

**EAL-1**
**Title:** Parametric analysis of salty taste perception under different conditions of feedback
**Authors:** Teresa L. Martín-Guerrero, Concepción Paredes-Olay, Juan M. Rosas & Manuel M. Ramos-Álvarez
**Affiliation:** University of Jaén, Spain
**Corresponding author email:** tmartin@ujaen.es
**Abstract:** Stimuli perception may be analyzed from two different perspectives: The degree to which the observer's responses mirror the stimuli and the degree to which responses display biases. Signal Detection Theory (SDT) was used to separately analyze these two elements in a simple detection task. Two studies were conducted to characterize observers' ability to detect a basic taste. Six concentrations of NaCl were used in order to quantify perceptual changes that occur when magnitude of the concentration is manipulated within a continuum of varying difficulty (ranged from 0.07 to 0.75%). Participants were required to discriminate between a salty solution (Signal stimulus) and a no-salt solution (Noise stimulus) with equal frequency of occurrence. Effects on the sensitivity were analyzed under two conditions of feedback. In Experiment 1, six groups of participants only received feedback about the accuracy of their response (correct-incorrect). In Experiment 2, incentives were associated to performance so that feedback received by participants was of the gain-loss type. Results supported predictions derived from SDT: Sensitivity index was affected by signal salience, and no differences were observed in performance based on the type of feedback. Implications for research in sensory evaluation and perceptual learning are discussed.

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**EAL-2**
**Title:** Illusion of control in pathological gamblers
**Authors:** Orgaz, Cristina[1], Estévez, Ana[2] & Matute, Helena[2]
**Affiliation:** [1]National University of Distance Education, Spain; [2]University of Deusto, Spain
**Corresponding author email:** scorgaz@psi.uned.es
**Abstract:** The illusion of control is a cognitive bias in which a person believes that he or she can control the outcome of an action or event while he or she has not real control. Given its definition as a cognitive bias it can often be observed in clinical conditions. In this study we show an illusion of control related to gambling. We used an experimental group of 49 pathological gamblers and a control group of 51 anonymous Internet users and submit them to the same experimental procedure for measuring the illusion of control. The results reveal significant differences in illusion of control between both groups.

**EAL-3**
**Title:** The behaviour of children with autism in a new environment
**Authors:** Ewa Pisula
**Affiliation:** University of Warsaw, Poland
**Corresponding author email:** ewa.pisula@psych.uw.edu.pl
**Abstract:** The aim of the study was to analyze the exploratory behaviour of children with autism in a new, low-stress environment. The subjects were 12 children with autism, 11 children with Down syndrome and 10 typically developing children aged 4-6. We analyzed the spontaneous behaviour of children in a new, unfamiliar environment (a room equipped with toys). Each child spent 15 minutes in the room with his/her mother. Three categories of behaviour were analyzed: interest in objects, contact with mother, and general locomotor activity. Differences between groups were found mostly for establishing various forms of contact with mother (rate lowest for children with autism), as well as visual exploration of the whole room – looking around, „eyesweeping" (rate highest for children with autism) and approaching the toy shelf (rate lowest for childen with autism). Results are discussed in the context of behaviour organization levels and complexity of exploratory behaviours.

**EAL-4**
**Title:** Three-dimensional vision aptitude predicts student's academic results in Geology teaching laboratories: An example of how experimental psychology methods may be transferred to other Sciences
**Authors:** Ramos-Álvarez, M.M., Sánchez-Gómez, M., Aristizábal, A., Pérez-Valera, L.A., Martín-Guerrero, T.L, & Rosas, J.M.
**Affiliation:** University of Jaén, Spain
**Corresponding author email:** jmrosas@ujaen.es
**Abstract:** This study analyzes the perception of Geology teachers that performance in some labs involving geological matters, especially those that

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imply three-dimensional analysis skills (e.g. “maps”, crystallographic solids or stereographic), entail extra academic failure that may affect even to students with a good overall performance. To explore this problem stereoscopic vision of students has been evaluated by three different tests that were applied to undergraduates of different degrees involving studies of Geology at the University of Jaen, and compared the results on these tests with their academic performance. It was found that the failure of a subgroup of students in those labs was related to three-dimensional vision problems. An early evaluation of these problems would place in the hands of the teacher and the educational system, a simple tool to diagnose and help students who, even with enough motivation, do not achieve the expected results. The results of this study exemplify how the methods used by Experimental Psychology may be successfully applied to help to solve issues that appear in the study of other Sciences.

**EAL-5**
**Title:** Personal involvement vs. response frequency as an explanation for the illusion of control.
**Authors:** Yarritu I., Matute H. & Vadillo M.A.
**Affiliation:** University of Deusto, Spain
**Corresponding author email:** iyarritu@deusto.es
**Abstract:** The Illusion of Control (IC) is a phenomenon by which people tend to believe that their responses cause outcomes which are actually uncontrollable. Different traditions have proposed different explanations for this phenomenon. On the one hand, Social Psychology has generally suggested that IC is the product of a motivation to maintain and enhance self-esteem. On the other hand, the Psychology of Learning generally regards this phenomenon as the result of a learning process that systematically leads to non-adjusted estimations of cue-outcome contingency under several specific situations. These situations are mainly related to outcome- and cue-density biases. Those two theoretical perspectives yield different predictions about the role of personal involvement on contingency estimations. According to the self-esteem approach, personal involvement is fundamental for the development of IC, whereas according to the learning approach the critical variable is the frequency of the response given by personally involved participants (i.e., cue-density bias). In two experiments we tested these predictions. The results support the learning approach, which can also explain the results typically described in the literature of IC from the self-esteem perspective.

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