POSTER 1

Sensitization of the rewarding effects of morphine: Effects of AMPA glutamate receptor blockade

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Drug addiction must be considered as a form of neural plasticity and the neuroadaptations leading to addiction and other forms of experience-dependent plasticity, such as learning and memory, share the same glutamate-dependent cellular mechanisms. Repeated administration of addictive drugs can produce an increase in some of their effects, i.e., sensitisation. In this work, we attempt to determine the role of AMPA glutamatergic neurotransmission in the development of sensitisation to the rewarding effects of morphine measured with the place preference conditioning procedure in mice. With this objective, we studied the effects of CNQX, an AMPA receptor antagonist, on the acquisition of sensitisation to place preference induced by morphine. To induce sensitisation, mice were pre-treated daily for 5 days with an injection of physiological saline (group S+S), 20 mg/kg of morphine plus physiological saline or CNQX 5 or 10 mg/kg (groups M+S, M+CNQX5 and M+CNQX10) and physiological saline plus CNQX 10 mg/kg (group S+CNQX10). After an interval of 3 days without any treatment, all groups were conditioned following an unbiased procedure after the administration of 2 mg/kg of morphine. The results obtained show that the group S+S which was pre-treated with saline and conditioned with 2 mg/kg of morphine did not present place preference, suggesting that this dose of morphine is ineffective to induce by morphine. To induce sensitisation, mice were pre-treated daily for 5 days with an injection of physiological saline (group S+S), 20 mg/kg of morphine plus physiological saline or CNQX 5 or 10 mg/kg (groups M+S, M+CNQX5 and M+CNQX10) and physiological saline plus CNQX 10 mg/kg (group S+CNQX10). After an interval of 3 days without any treatment, all groups were conditioned following an unbiased procedure after the administration of 2 mg/kg of morphine. The results obtained show that the group S+S which was pre-treated with saline and conditioned with 2 mg/kg of morphine did not present place preference, suggesting that this dose of morphine is ineffective to induce rewarding effects. Conversely, the group M+S, which was pre-treated with 20 mg/kg of morphine and conditioned with 2 mg/kg of this drug, acquired a clear place preference. Thus, morphine pre-treatment potentiates the effects of an ineffective dose of morphine, demonstrating the existence of sensitisation to its rewarding effects. Moreover, the higher dose of the AMPA antagonist CNQX produced a blockade of the effects of pre-treatment with morphine, suggesting the involvement of AMPA glutamate neurotransmission in the development of sensitisation to the rewarding effects of morphine.

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POSTER 2

The role of dopamine in the innate attraction towards male pheromones displayed by female mice

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Female mice raised in absence of male-derived chemicals intensely explore male-soiled bedding and prefer it to female-soiled bedding in a two-choice test. Recently, we demonstrated rewarding properties of male pheromones to female mice using the conditioned place preference paradigm (Martinez-Ricos et al, 2004, FENS Abstr., vol.2, A152.19).
The neural basis of the rewarding properties of sexual pheromones is unknown. Since dopamine is thought to be involved in reward-related processes, we have investigated the effects of intraperitoneal injections of antagonists of D1 (SCH 23390, 0.02 mg/kg) and D2 receptors (Sulpiride, 20 mg/kg) and of an indirect dopamine agonist (D-amphetamine, 0.5-2 mg/kg), on the attraction of female mice towards male pheromones. Surprisingly, preference for male-soiled bedding is enhanced by sulpiride but not by SCH 23390. On the other hand, the preference for male pheromones was abolished by both amphetamine doses. Given that amphetamine administration has been shown to affect the olfactory sensitivity, we performed an habituation-dishabituation test for olfactory function that showed impaired olfactory discrimination in high- but not in low-dose amphetamine-treated animals. Histological data suggest that these effects of amphetamine might occur in the olfactory bulbs.
Therefore, activation of D1 dopamine receptor is not necessary to recognize pheromones as rewarding stimuli, whereas activation of D2 receptor seems to decrease the rewarding properties of sexual pheromones. Moreover, increased dopamine levels induced by amphetamine might activate D2 receptors thus decreasing the pheromone-induced reward. Conversely, high doses of amphetamine might decrease sensitivity of vomeronasal system, although our histological data do not support this view. This work is funded by the Spanish MEC and European FEDER (BFU2004-04272/BFI)

POSTER 3

Electrical stimulation of the pedunculopontine tegmental nucleus in freely moving rats: time- and site-specific effects on two-way active avoidance conditioning

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The pedunculopontine tegmental nucleus (PPTg) is involved in the regulation of thalamocortical transmission and of several functions related to ventral and dorsal striatal circuits. Electrical stimulation of the PPTg in anaesthesized animals increases cortical arousal, cortical acetylcholine release, and substantia nigra dopaminergic activity. In turn, integrity of the PPTg is required to acquire several learning tasks, such as two-way active avoidance. It was hypothesized that PPTg stimulation could improve learning by enhancing cortical arousal and optimizing the activity of striatal circuits. We tested whether electrical stimulation of the PPTg, applied in freely-moving awake rats, would improve the acquisition and/or the retention of two-way avoidance conditioning, and whether this effect would depend on the specific PPTg region stimulated (central-rostral versus caudal) and on the time of stimulation: just before (pretraining) or immediately after (post-training) each of three training sessions. Electrical stimulation consisted of 1-Hz current trains composed of 0.2 ms pulses (frequency: 100 Hz), and intensity ranged from 40 to 80 μA. Each treatment session lasted 20 minutes. Results showed that 1) this stimulation did not induce either any signs of distress nor abnormal behaviours, apart from some motor stereotyped behaviours that dissapeared when current intensity was lowered; 2)pretraining stimulation applied at the rostral-central PPTg improved the acquisition of two-way active avoidance, 3)neither posttraining stimulation at the rostral-central PPTg, nor pretraining and posttraining stimulation at the caudal PPTg had any significant effects on learning. The results are discussed in terms of the role of different PPTg regions in striatal functions and thalamocortical control.

POSTER 4

The importance of color vision for fruit detection by squirrel monkeys (Saimiri sciureus)

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Primates are the only placental mammals with trichromatic vision. Within this order, most platyrrhines have a visual polymorphism characterized by the presence of multiple alleles of M/L gene in the X chromosome. Accordingly, all males and homozygous females are dichromats, while heterozygous females are trichromats. In an attempt to explain the maintenance of these multiple alleles, two hypotheses based on mechanisms of selection have been provided. In the first, known as selection by heterosis, heterozygous females have perceptual advantages when compared to dichromats, such that trichromacy would be favored by the existence of different visual pigments. The second hypothesis states that dichromacy would be advantageous in some situations, polymorphism being maintained by a frequency dependent selection. In this study the spectral composition of fruits and flowers foraged by a troop of squirrel monkeys (*Saimiri sciureus*) was determined using a spectrophotometer. These animals have an S cone with a spectral tuning of approximately 430 nm and three M/L alleles with spectral tunings at 535 nm, 550 nm and 562 nm. Based on data from the different phenotypes and that of the spectra obtained from the foraged items, the response of the different visual systems to the measured objects were modeled and then compared. The model predicted that trichromatic phenotypes would have an advantage over dichromats in fruit and flower segregation. These results suggest that, at least in S. sciureus, heterosis seems to be the mechanism maintaining the observed polymorphism. Additional studies are necessary, however, to determine if other important aspects of the primates' visual world, such as prey, predator and con-specific detection, favor trichromacy or dichromacy.

Key words: visual polymorphism, neotropical primates
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POSTER 5

Are interhemispheric transfer time and hemispheric asymmetries really assessable by Reaction Time analyses ?

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Callosal transfer time is generally assessed by reaction time (RT) analyses in target detection tasks using key-press responses (the so-called Poffenberger paradigm). Crossed-uncrossed differences (hands x visual hemifields –CUD-) are supposed to reflect interhemispheric transfer (IT) time. It has consistently been estimated about 4-5 ms for such simple detection tasks. If several IT may occur during simple interhemispheric visuomotor integration (e.g., Iacobini & Zaidel, 2004), it is accepted that they all precede motor programming processes. Accordingly, RT differences are never interpreted as reflecting motor effects in these studies or in others using CUDs as variables to assess hemispheric asymmetries (e.g., Barthélémy & Boulinguez, 2002).
In this study, we have tested the hypothesis of asymmetric motor activations in such paradigms by analysing changes in the electrophysiological activity of the *flexor pollicis brevis* during key-press responses to lateralized visual stimuli. RT was fractioned into premotor (PMT) and motor (MT) times according to the first electromyographic response. No significant asymmetric MTs were found in the group statistics (12 right handed subjects). However, individual analyses revealed that 6 subjects showed shorter MT for the right hand whereas 3 showed shorter MT for the left hand. Only 3 subjects did not provide any significant difference between the hands.
We conclude that, even for simple key-press responses, asymmetric motor activations are observed that bias RT. Because of a strong interindividual variability, these motor asymmetries are not observable in classical group analyses. Even though we do not know where these asymmetries come from, we propose to use PMT rather than RT as a tool for understanding simple interhemispheric visuomotor integration.
Barthélémy, S., & Boulinguez, P., (2002a). Orienting visuospatial attention generates manual reaction time asymmetries in target detection and pointing. *Behavioural and Brain Research*, 133, 109-116.
Iacoboni, M., & Zaidel, E., (2004). Interhemispheric visuo-motor integration in humans: the role of the superior parietal cortex. *Neuropsychologia*, 42(4), 419-25.

POSTER 6

Learning-induced reduction in predisposition for LTP: mechanism and functional significance

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We studied the relations between learning-induced single-cell modifications and the threshold for LTP and LTD induction. Rats were trained in an olfactory discrimination task to distinguish between positive and negative odor cues until they demonstrated rule learning. Learning-induced cellular and molecular modifications were subsequently studied in the piriform cortex. Two types of cellular modifications appear one day after learning: enhanced neuronal excitability, which is the result of reduction in an intrinsic potassium current (Saar and Barkai, 2003 *EJN, 17:2727-34*) and reduced predisposition for LTP induction (and increased predisposition for LTD induction). This shift in the threshold for LTP and LTD is a consequence of a change in the subunit composition of the NMDA receptor, resulting in receptors with a higher complement of the NR2a subunit protein relative to NR2b (Quinlan et al., 2004 *Neuron, 41:185-192*). Learning-induced synaptic strengthening becomes apparent on the third day after training, and is maintained by different mechanisms. Enhanced synaptic release is indicated by reduced paired pulse facilitation (Saar et al., 1999 *JNS, 19:8616-8282*), post synaptic modifications in the neuronal cable properties are indicated by enhanced rise time of the post-synaptic potentials (Saar et al., 2002 *JNP, 87:2358-2363*), and enhanced synaptic connectivity is indicated by increased spine density along dendrites of pyramidal neurons (Knafo et al., 2001 *EJN, 13:633-638*). One possible function that learning-induced molecular and physiological modifications in the NMDA receptors may serve is protecting the neuronal circuit against runaway synaptic strengthening. Such protection is achieved by razing the threshold for activity-dependent synaptic enhancement. However, once an external stimulus reaches this threshold, the information it carries would be stored quickly and efficiently.

POSTER 7

Synaesthesia in the Irish Population: The influence of genetics and development

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The aim of our study was to systematically assess the familial and phenotypic characteristics of synaesthesia in the Irish population. Questionnaire data was collected as part of an ongoing study into the phenotypic and neurobiological characteristics of synaesthesia. We present findings based on individual and familial data from 56 synaesthetes. Respondents were predominantly female with a gender bias of 7:1. Data was collected on age, gender, handedness, medical history, memory abilities, types of synaesthesia, co-existence of more than one type of synaesthesia, unidirectionality; trends in letter, colour and number associations and the relationship between inducers and concurrents. The most common form of synaesthesia was lexical-colour synaesthesia. Less common forms included coloured-taste, coloured-pain and coloured-personalities. The majority of individuals in this study recall the experience of synaesthesia from early childhood, suggesting a neurodevelopmental basis. 51% of individuals report a positive family history of synaesthesia. Our data are consistent with dominant inheritance of synaesthesia, either autosomal or X-linked, but we provide evidence against the model of synaesthesia as an X-linked dominant trait that has a high lethality rate in utero for males. We found that different types of synaesthesia can occur within the same family, suggesting that a single genetic mechanism underlies all types of synaesthesia. We suggest that variation within a single gene increases the likelihood of associations within polymodal, multisensory cortical regions. We propose a 'synaesthesia critical period' when arbitrary associations (such as those between graphemes and colour) are consolidated in the brain.

POSTER 8

Time-frequency analysis of corticomuscular relations in a child with congenital hemiplegia

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Correlation analysis of electroencephalographic (EEG) and electromyographic (EMG) signals is a potential method for functional mapping and studies of plasticity. The bio-medical signals are rich in dynamic, time related data, nonstationary, and partly disturbed by noise and artefact. They can be easily submitted to time-frequency and time-scale methods. A technique to extract the non-trivial modulation/attenuation laws due to weak interaction between a pair of EEG-EMG signals is presented using wavelet analysis. Qualitative and quantitative information about interaction between EEG and EMG are obtained through characteristic modulation laws in amplitude and frequency. Phase relations are also explored.
The subject was a 4 year old child with a large congenital left middle cerebral artery territory infarct and right hemiplegia. Transcranial magnetic stimulation (TMS) of the intact left motor cortex elicited normal contralateral motor responses in biceps. However, no muscle response was seen with TMS to the damaged motor cortex. Unusually, stimulation of the occipital cortex produced a reproducible response in the affected biceps.
EEG and EMG were recorded while the subject performed tasks involving contraction of biceps. Instantaneous spectral energies were computed. Cross-correlation and modulation laws in two bands (around 10Hz and 20 Hz) were studied. A correlation was seen between the occipital EEG and the right biceps EMG, consistent with the TMS findings.
The corticospinal tract is known to arise from extensive areas of neocortex during development in rats and primates, but these projections subsequently become restricted. In our subject, the large infarct partly deprived the visual cortex of afferent information. This may have led to retention of functional corticospinal projections from this area, revealed by the complementary methods of TMS and EEG-EMG time-frequency studies.
Funding: Wellcome Trust.

POSTER 9

A dual system of innervation to the epidermis revealed in transgenic mice expressing eGFP under the regulation of the promoter Thy1.2.

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In transgenic mice in which the Thy 1.2 promoter drives the expression of a marker gene, many different patterns of expression are observed (Caroni P, 1997). In one line of animals generated using this approach to drive the expression of enhanced green fluorescent protein (eGFP), a sub-population of small dorsal root ganglion neurons was found to express eGFP and this has now been subjected to more detailed investigation. Inbred transgenic CB6 mice expressing eGFP were terminally anaesthetised and fixed by vascular perfusion with 4% parformaldehyde. Sections from a range of tissues were sectioned and stained immunocytochemically for substance P or calcitonin gene-related peptide (CGRP). In these mice, eGFP was found in primary afferent fibres innervating the epidermis and hair follicles in hairy skin. No eGFP containing afferents were found in non-hairy skin, or other tissues or organs. The labeled fibres cross the dermis with few branches and on entering the epidermis break up into fine branches. A few fibres curve back to form small numbers of specialized endings on the bases of hairs. Double staining for CGRP reveals that some fibres expressing this peptide run with the eGFP expressing axons through the epidermis. As seen in the dorsal root ganglion, the two afferent populations are completely separate. The CGRP innervation density in the epidermis is much lower with wide separations between fibres.
These observations support the view that multiple primary afferent populations innervate the epidermis. One population forms a dense fine axon plexus, the other contains the neuropeptides substance P and CGRP and is more sparely distributed.
Caroni P, 1997. J Neuroscience Meths 71, 3-9
Supported by the BBSRC

POSTER 10

Assessing the executive functions of students on a third level introductory programming course

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The aim of this study is to identify tests of cognitive skill that will allow us to distinguish between subjects who are likely to be good computer programmers. The main hypothesis is that different brain regions are recruited to solve cognitive problems and that the nature and extent of this recruitment is correlated with the degree of success in problem solving. More specifically, we propose that the frontal area plays a central role in the type of problem solving that underlies skilled programming and that the degree of frontal involvement correlates with programming skill. The hypotheses are formulated within the theoretical framework of collaborative cell assemblies (Reilly, 2001). According to this theory, high level cognitive skills are constructed upon lower-level ones, which in turn are built upon sensorimotor functions of various kinds. The tasks used in this study include n-back, Tower of London and Stroop. Data was collected using a purpose-built computer-based test and subject samples were drawn from four different third level institutions all studying introductory programming courses. We tested a number of hypotheses including (i) skilled programmers would complete the Tower of London task in less moves than unskilled programmers, (ii) as skilled programmers advanced from level to level in the Tower of London task a recursive solution pattern would evolve while the solutions of unskilled programmers would appear more random, (iii) skilled programmers would achieve a higher score (higher number of correct responses) than unskilled programmers in the Stroop task and (iv) skilled programmers would achieve a higher score than unskilled programmers in the n-back task and (v) there would be a difference in the average time to solution between skilled and unskilled programmers on all three tasks. The results of our study are presented and discussed. The findings have encouraged us to initiate a further study using an EEG recording system and a variety of dependent measures relating to the spatio-temporal features of EEG patterns.

POSTER 11

Beta2-containing nicotinic receptor of the ventral tegmental area are crucial for acquisition of nicotine self-administration but not for nicotine withdrawal syndrome

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We contrast here the ability of mice knockout for the β2 subunit of the nicotinic receptor (β2-/- mice) to acquire intra-VTA self-administration of nicotine and to exhibit nicotine withdrawal syndrome. As compared to WT mice which exhibited intra-VTA nicotine self-administration, β2-/- mice showed no self-administration of nicotine, but showed normal morphine self-administration. When the β2 subunit was re-expressed via a viral vector specifically within the VTA, the nicotine self-administration was restored. These results show that functional β2-containing nicotinic receptors within the VTA are necessary and sufficient for nicotine to produce addictive behaviour. In contrast, β2-/- mice showed normal nicotine withdrawal syndrome, suggesting that the β2-containing nicotinic receptors are not involved in the behavioural signs induced by

nicotine abstinence. However, withdrawal-induced changes in locomotor activity were altered in β2-/- mice, suggesting that withdrawal signs may reflect the activity of multiple circuits and/or receptors subtypes.
The present results suggest that, although the β2-containing nicotinic receptors of the VTA play a critical role in mediating the rewarding effects of nicotine, they do not mediate withdrawal signs, excluding therefore a systematic relationship between self-administration and withdrawal processes in nicotine addiction.
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POSTER 12
The roles of excitatory spinal interneurons in zebrafish motor circuits.

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Circumferential Descending (CiD) spinal cord interneurons are the only known excitatory interneurons in the neural circuit model for zebrafish escape. These cells receive excitatory input from one of two reticulospinal Mauthner cells (M-cells), and are suggested to be important for the coordination of the initial C-shaped body-bend of the escape. In addition to the M-cell, activity in two M-cell homolog pairs contribute to the response; however, it is unknown whether they excite CiDs. The goal of this study is to determine whether CiD activity is dependant on M-cell excitation, or can be generated by M-cell homologs or the M-cell and other inputs. Directional stimuli, tapping either the head or the tail, elicit activity in, respectively, the M-cell and its homologs or the M-cell alone. We use the difference between stimuli in combination with selective ablations of M-cells and calcium imaging of CiDs to examine CiD inputs. In M-cell-ablated fish, CiD activity is repeatably observed in response to both head and tail stimuli (N=3 fish, 3 cells/fish, 5 head and 5 tail stimulated trials/cell). In addition, in ablated animals, CiD activity is of greater intensity in response to head-tap stimulation ($p=0.0102$) than to tail. CiD activity post-ablation demonstrates that CiDs must be receiving non-M-cell inputs. That CiD activity was recorded in response to tail stimuli indicates that CiDs receive inputs from sources other than the M-cell homologs. This finding also suggests that CiD activity is not limited to high performance escape, but is involved in formation of the general escape or escape-like bending patterns in diverse behaviours. That there is a higher level of CiD activity to head stimulation than to tail in M-cell ablated fish suggests that they are receiving input from reticulospinal cells and that this input may modulate the kinematic pattern of startles in intact fish. Supported by NIH RO1 NS043977 to MEH.

POSTER 13
Sex differences in a spatial reference memory task associated with cytochrome oxidase activity throughout the postnatal development

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Sexual differences in cognitive capacities as learning and memory have been related to the gonadal steroids action. The subjects of both sexes show differences in many behaviors such as in the spatial orientation one. This behavioral dimorphism could be due to the use of different strategies of navigation. The spatial learning requires the use of a spatial reference memory (RM). The aim of this work is to analyze the orientation navigation of male and female rats, throughout the postnatal development in a RM task in the holeboard. Four experimental groups were used: males and females (30 days), males and females (90 days); and the following parameters were analyzed: the RM index, the correct sequence of reinforced visits, the time spent in each trial, the speed of execution, the total distance covered and the number of rearing. Cytochrome oxidase (CO) activity, an endogenous metabolic marker for neuronal activity, was measured in all the groups. We evaluated the oxidative metabolic activity of the medial and lateral nuclei of the mammillary bodies (MB) and major hippocampal divisions (CA1, CA3 and DG) after training in the Holeboard maze. Our results suggest that a behavioral dimorphism exists in the execution of the RM task. Basically, females showed a worse performance than male rats did. These differences were observed in the animals of 30 and 90 postnatal days as in the most of the parameters analyzed. In addition, we suggested an important implication of the CO activity in the MB nuclei and hippocampus in this spatial reference memory task in both sexes.

POSTER 14
Sleep deprivation affects sleep pattern in the domestic chick (*Gallus gallus*)

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Short term sleep deprivation seems to lead to a high need for sleep, which can be homeostatically regulated through more and/or intensified sleep (Tobler, 1995, *Behav. Brain Res*. 69:35-41). Currently there is very little evidence on the effects of sleep deprivation in birds. We investigated sleep deprivation during the first two weeks of life in young domestic chicks. Chicks exhibit unihemispheric sleep, a unique behavioural and electrophysiological state, widespread among many species of birds, in which one hemisphere is awake while the other is sleeping. Previous studies (Mascetti et al.,

1999, *Cogn. Brain Res*. 7: 451-463; Mascetti et al., 2004, Behav. Brain Res. 153 (2): 447-452) suggested that unihemispheric sleep in chicks would be associated with another remarkable feature of chick's cerebral organization: the brain lateralization of functions. Dark-incubated female chicks (N=72) were reared with an imprinting object, in order to reduce isolation stress, and deprived of total (monocular and binocular) sleep. Separate groups of chicks were sleep deprived either on the 5th (N=24), on the 8th (N=24), or on the 11th (N=24) day of life. In each group, 8 chicks were sleep deprived for 2h, 8 chicks for 4h, and 8 chicks for 6h. Deprivation was obtained with the use of a special treadmill. After deprivation behavioural sleep patterns were immediately recorded for 6h consecutively, scoring the number and the duration of episodes of binocular (both eye closed) and monocular (one eye closed and the other opened) sleep. Data so far collected suggest that the amount of sleep deprivation affects subsequent sleep patterns, and there seems to be a difference with previous studies on chicks not sleep deprived.

POSTER 15

Electrical stimulation of the nucleus basalis magnocellularis in rats: analysis of HZF-3 and c-Fos expression

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Previous data from our laboratory have shown that electrical stimulation of the nucleus basalis magnocellularis (NBM) immediately before training significantly improves learning of two tasks (active avoidance and social transmission of food preferences), supporting a role of NBM in early stages of memory formation. The current study investigated the brain regions involved in the NBM induced-memory facilitation by examining the activation of two immediate early genes (hzf-3 and c-fos) after NBM electrical stimulation. The expression of HZF-3 (or Nurr-1) is associated with learning and memory processes especially in the amygdala and the hippocampus, and c-Fos expression might be a more general marker of cell activation but is also related with neuronal processes underlying memory. The rats were divided into three groups, stimulated, control (electrode implantation), and sham groups. In the stimulated group, the NBM was activated unilaterally for 20 min applying 100-µA square pulse trains (train frequency: 1 Hz, train duration: 500 ms). The tissue samples were obtained from rats sacrificed 2 hr after stimulation or pseudo-stimulation. We have analysed 3 was more intensely expressed than c-Fos. In general there were not marked differences in the number of HZF-3-like immunoreactive neurons between stimulated and control groups. However, the expression of c-Fos in the stimulated group was higher in the retrosplenial, prelimbic and parietal cortices, the medial thalamus, lateral habenula, ventral hippocampus, dentate gyrus, and central amygdala.
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POSTER 16

Identification of complex spatio-temporal tactile stimuli in the gracilis nucleus of the rat

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To study the neuronal properties and mechanisms involved in the processing and coding of tactile stimuli, and in particular in stimuli discrimination, we analyse the neuron responses of the rat gracilis nucleus generated by complex mechanical stimuli applied on the hindlimb. The stimuli we applied were formed by the contact of multiple pins and varied in their spatial frequency, direction, total duration and contact to the skin . To monitor the neural activity we used single and multielectrod recording techniques. This way we analysed the temporal and spatial resolution of the neurons, depending on the stimulation frecuency, stimuli duration and distance between pins. We obtained the firing patterns that characterize the direction of the stimuli and the aplitude of the stimulated surface. In this context we have determinated the role of the firing frequency and the interspike time intervals in the coding of the stimuli. We identified different oscillatory patterns depending on the stimuli and the part of the receptive field we were stimulating. Our results suggest that the oscillatory activity in the lower station of somatosensory pathway play an important role in the selection and/or coding of significant characteristics of the stimuli. Grants BFI2003-05818, IST01-7-1B-34892, CAM3-08.5-0064.1-2003, BFI2002-01767

POSTER 17

Enduring effects of chronic unpredictable stress in mid-aged rats on spatial learning and memory in aging

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Several studies have reported that chonic stress can impair hippocampus dependent learning and memory tasks, including the Morris water maze. These deficits are probably due to the deleterious effects that chonic stress can exert on hippocampal structure and function, including, dendritic atrophy, impaired synaptic plasticity and decreased neurogenesis. Usually, these cognitive deficts are reversed when the stressfull situation cease. In the present study, we investigated the effect of a chronic unpredictable stress in mid-aged rats on spatial learning and memory in aging. Male Wistar rats, 12 months old, were submitted to a chronic multiple

stress paradigm (a different types of stressors presented randomly over a period of 28 days), or left undisturbed in their home cages. When animals were 18 months old, they were trained in the Morris water maze (three consecutive days, three trials per day), and a marked impairment in spatial learning was found in the stressed group compared to undisturbed rats. Moreover, in the probe test, one day after training completion, a significant spatial memory deficit was found in those animals that were stressed at mid-age, but not in the undisturbed group. These results indicate that chronic unpredictable stress during adulthood can lead to an enduring cognitive deficit at aging.

POSTER 18

Hypoglutamatergia in the rat medial prefrontal cortex in two models of schizophrenia.

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In the present study we used microdialysis in the medial prefrontal cortex (mPFC) of the rat to investigate the effects of isolation rearing or maternal deprivation on basal and KCl stimulated glutamate release and their response to chronic clozapine administration. In the isolated group young adult rats were weaned on postnatal day 25 (P25) and housed individually while the maternally deprived group experienced a single 24-hour period of maternal deprivation on P9. A socially reared group acted as controls.
Basal dialysate glutamate levels (mM) were 7.2±3.8 (n=6) in vehicle treated social controls but were reduced by 74% and 61% to 1.9±1.1 (n=6, p=0.0169 v's control) and to 2.8±2.3 (n=5, p=0.079) respectively in both isolated and maternally deprived rats. Intra-mPFC KCl (100mM, 20mins) rapidly increased local glutamate release to by +27%, +173% and +118% to 9.2±3.7, 5.2±1.4 and 6.1±2.6 respectively in the control, isolated and maternally deprived rats. Chronic clozapine (5mg/kg i.p. daily for 10 days) reduced basal glutamate levels by 80% to 1.4±0.75 in controls (p=0.021 v's vehicle control). However there was a tendency for clozapine to increase basal glutamate levels in the isolated rats to levels that did not differ significantly from those in vehicle treated control rats (p=0.0633 v's control).
Taken together, these findings show that both isolation rearing and maternal deprivation are associated with medial prefrontal *hypoglutamatergia* which may in part, underlie the behavioural abnormalities observed in these animals. Furthermore, the finding that clozapine at least partially reverses the prefrontal *hypogluatmatergia* in the isolated rat suggests that this model may be useful in the development of novel and more effective antipsychotic drugs.
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POSTER 19

Analysis of *zenk* expression in the pigeon archistriatum after training in a classical sound-shock conditioning

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This study aimed at identifying brain areas involved in the classical aversive conditioning in pigeons (Columba livia), especially the archistriatum, by monitoring the expression of the product of the transcriptional regulator zenk (zif268, egr-1) driven by the exposure to tone-shock associations. The experimental group (EG) was submitted to a 20-min session with three tone-shock associations (1000Hz, 88dB, 1s/10 mA, 1s) in 5-min intervals. The context control (CCG), shock control (SKG) and the sound control groups (SCG) were exposed only to context in the experimental box and sound, respectively, and the manipulation control group (MCG) was only manipulated. One hour after the end of the session, the pigeons were sacrificed and sections of the brain were treated with standard immunohistochemical procedures to detect the Zenk protein. The quantification of immunoreactive nuclei expressed in the archistriatum was carried out with an automatic methodology based on the Image software (NIH-USA). Behavioral analysis were conducted by evaluating the freezing behavior of the pigeons. The analysis of Zenk expression revealed a more pronounced archistriatal expression in the SKG than in MCG animals (143% higher). The EG and SCG also showed a higher zenk expression than MCG (77% and 63%, respectively). A higher occurrence of freezing after the stimulus presentation was observed in SKG, SCG and EG. Together with the information about the anatomical, hodological and neurochemical organization of the avian archistriatum, these data can contribute to the understanding of mechanisms underlying memory and learning.
Supported by FAPESP and CNPq

POSTER 20

Visual modulation of subicular place cells firing fields

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Subicular place cells (SPCs) and hippocampal area CA1 place cells (HPCs), have different properties regarding the stability and modulation of their firing fields. Thus, SPCs tend to have similar firing fields in different arenas, while HPCs show higher arena specificity. Also, CA1 PCs tend to display stable firing field across alternating periods of light-dark-light. Their remapping is higher if the animal is first placed in the darkened arena, showing the original firing field if the animal is placed again in the same bright chamber. Thus, visual inputs are a determinant of CA1 place field. By contrast, it is not known what the effects of visual inputs on SPCs

are. We have explored the role of visual inputs in the firing of 108 cells using chronically implanted tetrodes to record single unit activity in the dorsal subiculum while the animal foraged for food in a square arena using 3 different protocols: 1) transitions from light to dark to light (LDL), 2) transitions from dark-light-dark (DLD) and 3) both. Different trends were found in the LDL and DLD protocols with a higher tendency for SPC to be stable. The most frequent patterns of response were classified into three differing unit types. *Type 1*: The firing fields (FF) of these units did not change across any condition. *Type 2 cells*: The FF of these units only changed during the second condition either dark or light condition. *Type 3*: Cells that remapped during the second condition then maintained the field during the third condition, either dark or light. Three major patterns were found in the third protocol. *Pattern 1*: their firing was stable across all conditions. *Pattern 2*: cells presented within protocol stability but not cross-protocol stability. *Pattern 3*: cells had different patterns of response in each protocol. Different patterns of response could indicate that different cells may integrate different types of information such as memory, egocentric or allocentric.

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POSTER 21

Consolidated fear conditioning engram reactivation makes it vulnerable to the disruption due to basolateral amygdala functional blockade

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When subjected to contextual fear conditioning animals exhibit conditioned «freezing» to the re-exposure to the surroundings where the training session (footshocks) took place, i.e. to «context». How well an animal has been conditioned is measured by freezing duration. In rats the bilateral reversible blockade of the Basolateral Amygdala (BLA) by local injection of 5 ng tetrodotoxin (TTX) induces retrograde amnesia when applied immediately but not 96 hours after contextual fear conditioning training. These results indicate that, after a sufficiently long consolidation duration the engram cannot be disrupted by BLA blockade (Sacchetti et al., J. Neurosci, 1999: 19, 9570-9578). In the present experiment rats were also subjected to contextual fear conditioning task. The retrieval test (animals again placed inside the conditioning apparatus without administering footshocks) was performed 144 hours after acquisition training. When BLA blockade was preceded by a 180 sec confinement in the conditioning apparatus without footshocks, there was retrograde amnesia also when TTX was applied 96 hours after acquisition training. These results suggest that the vulnerability of a memory trace is not a monotonous inverse function of the time elapsed from its acquisition but that it can also be influenced by engram activation (Bucherelli and Tassoni, Behav. Brain Res., 1992: 51, 61-65). Thus, memory disrupting treatments, if applied shortly after the original training can also disrupt well consolidated memories when these are activated by a reminder cue.

POSTER 22

Visualisation of neurotransmitter release in intact conscious brain using an integrated software toolkit

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This paper will describe a software toolkit (BrainAid) that simplifies and unifies the visualisation and analysis of experimental data, derived from typical microdialysis experiments. The toolkit allows the user to construct diagrams of neural circuits and to map experimental data, sourced from a relational database, to specific brain regions defined in the circuit. This mapping of data to the graphical representation of the circuit allows the user to create an "animation" of neurotransmitter fluctuations, providing a global overview of the circuit dynamics.

The result is a dynamic presentation of the circuit providing all neurotransmitter levels within the entire circuit in a coherent, visual framework. The user can play the animation through over the time course of the experiment and move forward and backwards to a specific time interval. This feature should help speed up data analysis by pinpointing interesting occurrences and behaviour within the circuit. It also serves to present a large amount of information to the user, in a digestible and interactive format.

Planned extensions to the system will allow the animation of two or more experimental datasets concurrently, which will permit an immediate visual comparison of global neurotransmitter levels for various drug treatments, etc.

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POSTER 23

Parietal lobe involvement in response inhibition

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We have previously reported that patients with parietal lesions were significantly more impaired than elderly controls in an oculomotor capture task, showing an impaired ability to suppress responses towards irrelevant distractors. Here we investigated how these same patients performed on an antisaccade task. All patients showed good prosaccade performance and most managed to suppress saccades in a fixation condition. Clear impairments were shown in the anti-saccade task in that patients made significantly more errors than controls, failing to suppress incorrect pro-saccades. These data further implicates parietal structures in response inhibition.

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POSTER 24

Spatial learning and object recognition in adult rats exposed pre- and/or postnatally to alcohol

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The aim of this study was to analyse the cognitive function in Wistar rats exposed to ethanol during prenatal and/or early postnatal period, using the "Can test", a novel spatial/object learning and memory task. Based on the type of feeding diet, the rats were divided into five groups: standard rat diet; isocalorically balanced liquid diet; and ethanol liquid diet (5 %, w/v) administered to the rats during gestation (E-IC), lactation (IC-E) or both gestation and lactation period (E-E). Pups were weaned at postnatal day 25 and at the age of two months they started to be trained to select a single rewarded can from seven cans. Four different conditions of the "Can test" were performed: spatial/object cue task (the rewarded can was placed at the fixed position and was from different brand that the other six cans); spatial cue task (the rewarded can was placed at the fixed position), simple object recognition task (the rewarded can was from different brand that the other six cans, random location in each trial) and complex object recognition task (each can was from different brand, the rewarded can had a random location in each trial). There were no significant differences between the groups in the first task. The learning process in the spatial cue task and simple object recognition task were significantly disturbed in the IC-E and E-IC groups. Moreover, the learning process to recognise the object in the complex task was significantly affected in the E-E, IC-E and E-IC groups. The results of the present study suggest that either prenatal or postnatal exposure to alcohol produce significant cognitive changes that persist into the adulthood.

POSTER 25

Role of the anandamide reuptake inhibitor AM404 in the modulation of emotional reactivity in rats

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The endocannabinoid system is involved in the regulation of several brain functions, yet evidence on its possible role in modulating behavior is still inconclusive. Several studies have shown that agents interfering with anandamide deactivation may be useful in the treatment of neuropsychiatric disorders, such as anxiety, psychoses and addiction. The present study investigated the behavioral effects of AM404, prototypical anandamide reuptake inhibitor. To evaluate the effects of AM404 on anxiety-related behaviors, the drug was tested in rats, using the elevated plus-maze and ultrasonic vocalization tests. AM404 evoked anxiolytic-like responses at doses that did not alter motor activity. Rats treated with AM404 (5 mg/kg, i.p.) spent a longer time in the open arms of the elevated plus maze than did vehicle-treated controls. This effect was significantly reduced by the CB1-receptor antagonist rimonabant (SR141716A, 1 mg/kg, i.p.). Accordingly, AM404 (1 mg/kg, i.p.) significantly decreased the rate of ultrasonic emissions in rat pups in a rimonabant-sensitive manner. In consideration of the well-known ability of some anxiolytic drugs to affect reactivity to environmental stimuli, AM404 was subsequently tested in the behavioral paradigm of the startle reflex. None of the given doses (2.5, 5, 10 mg/kg, i.p.) was able to significantly alter startle amplitude. Similarly, AM404 did not affect the prepulse inhibition of the startle at any dose (2.5, 5, 10 mg/kg, i.p.), suggesting that this drug does not affect sensorimotor gating and informational processing. Finally, AM404 was tested in the paradigm of conditioned place preference to assess its hedonic properties. Rats exhibited a dose-related, inverse U-shaped effect for AM404, showing significant preference only for the dose of 2.5 mg/kg, but not for 1.25, 5 and 10 mg/kg (i.p.). Collectively, our results highlight anandamide reuptake inhibitors as a novel, promising category of anxiolytic agents, with potentially fewer side-effects in cognition and motivation.

POSTER 26

Neuro-glial and neuro-immune interactions underlying post-lesional plasticity in the CNS after vestibular deafferentation.

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Vestibular deafferentation induces a severe oculomotor and postural syndrome. This syndrome is provoked by the asymmetry of activity in vestibular nuclei neurons (VNn) on either side of the brainstem. Indeed, neural activity in the ipsilateral VNn is depressed immediately after deafferentation whereas it is increased on the contralateral side. The deafferented (d)VNn progressively recovers normal neural activity within a week, which contributes to abating the vestibular syndrome because of the vestibular compensation process (VC). The restoration of VNn activity relies on CNS post-lesional plasticity because deafferentation results in a permanent loss of vestibular inputs from the lesioned side. To date, the molecular mechanisms underlying the VC process remain incompletely understood.
In an earlier study we characterized the activation of microglia and astrocytes within the dVN. Glial activation did not depend on degeneration of the vestibular nerve, on apoptosis of VNn or on the depression of the VNn activity per se. In this study we found that deafferentation induced an increase in IL1β, IL-6, TNF-α, TGF-β1,

MCSFR, C3aR and C5aR mRNAs within the dVN. Neuroinflammatory mechanisms may therefore underlie some features of the VC process within the dVN. Neuroimmune active molecules observed within the dVN, are known to be released at sites of neuroinflammation and neurodegeneration. These molecules may then be involved in the signaling cascade which produces dVN glial activation. They may facilitate the survival of dVNn and therefore act to promote the recovery of normal neural activity of the dVNn during the VC process.
Glial activation reflects a graded response, which is a consistent feature in all forms of neuroinflammatory and neurodegenerative conditions. Neuroimmune active molecules that modulate neuronal activity may provide a cellular basis for understanding the impairment of neurological function in CNS disorders associated with inflammatory conditions and neurodegenerative diseases. This work suggests that Vestibular deafferentation is a good model to study the bidirectional neuroglia and neuroimmune interaction underlying post-lesional plasticity in the CNS.

POSTER 27

7-OH-DPAT effects on behavioural responses to noxius stimuli, in the rat.

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Dopaminergic D2-like receptors are known to play a role in pain modulation, however, scanty data describe the influence exerted by D_3 receptor subpopulation. Aim of the present research was to analyse the possible relationship between D_3 receptors and different behavioral responses to noxious stimuli. 5 groups of male wistar rats were used: 4 groups were intraperitoneally injected with the D_3 agonist 7-OH-DPAT (0.5, 1, 2, 4 mg/kg) and a control one was injected with saline. Experimental apparatus consisted of a hot plate heated at 54 ± 0.5 °C. Rats were placed on the plate and removed when showing signs of discomfort. Each group was tested from 5th to 60th min post injection at regular intervals. Total number (Tn) of behavioral responses and latency of the first one (1stRL) were recorded with a digital videocamera. Later, a frame by frame analysis was performed using a professional videoplayer. A time course analysis of latencies and number of responses was also carried out. Results, expressed as mean ± S.E., showed a dose dependent increase of the 1stRL, whereas a decrease of Tn occurred. In vehicle administered rats, mean of 1stRL was about 1000 ms and mean of Tn was about 9. At the highest 7-OH-DPAT dosage, results were about 2500 ms for 1stRL and about 5.00 for Tn. Using one way analysis of variance and the Newman-Keuls post-hoc test, comparison between groups showed significant differences both for 1stRL and Tn of behaviour. An interaction of 7-OH-DPAT with central mechanisms involved in pain modulation could be suggested, moreover an influence of D_3 receptors on sensorimotor integration mechanisms will be discussed.

POSTER 28

Evidence of configural processing in crossmodal face matching.

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Visual researchers often cite configural face processing, and its disruption due to inversion, as evidence of a face-specific processing mechanism. Recently a haptic face inversion effect was demonstrated. Researchers found poorer matching performance for inverted facemasks relative to performance for upright facemasks or inverted teapots in a haptic discrimination task. This suggests that the haptic system also relies more on the processing of configural information during the recognition of upright faces. Previously we reported that familiar and unfamiliar faces could be matched successfully across the visual and haptic modalities. Here we tested whether this crossmodal matching ability is facilitated more by a featural or configural strategy. We employed an alternative paradigm to inversion, using upright intact, blurred, and scrambled visual stimuli in a crossmodal matching task. We found a cost in matching performance for facemasks matched to scrambled stimuli relative to that for both intact and blurred images. This suggests that configural face information underpins more efficient crossmodal face matching

POSTER 29

Developmental progression of sensorimotor gating deficits in two models of schizophrenia and the impact of an atypical neuroleptic, clozapine

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Schizophrenia is a complex disorder that emerges in late adolescence or early adulthood. Here, we present data on the emergence of a core symptom, sensorimotor gating deficits, as assessed by prepulse inhibition of startle reflex (PPI), in two animal models of the disorder. We evaluated Wistar rats (n's=7-8) that were either deprived of maternal care for a single 24 hour period on postnatal day (P) 9 (MD) or were reared in isolation from P25 (IR). In comparison to socially reared controls, MD animals developed no PPI deficits when assessed at P 30, 40, 60 and 80. However, IR animals manifested reductions in PPI performance at P60 ($F[1,56]=15.38$; $p=0.0002$) and these persisted through P80 ($F[1,52]=17.35$; $p=0.0001$). In order to evaluate the impact of neuroleptics on PPI, we dosed with clozapine once daily (5 mg/kg) to all groups for a

period of 10 days prior to testing, with animals drug free for 24 hours prior to testing. Clozapine partially reversed PPI deficits in IR rats at P60 ($F[1,56]=4.245$; $p=0.044$) and P80 ($F[1,56]=5.474$; $p=0.023$). Conversely, clozapine induced significant impairments in PPI performance of adult (P80) social control ($F[1,56]=8.533$; $p=0.005$) and MD ($F[1,52]=11.41$; $p=0.004$) rats where no such deficit had previously existed. The data indicates that isolation rearing animals from P25 represents a robust and representative model of sensorimotor gating changes observed in schizophrenia with symptoms emerging in early adulthood. Further, symptoms respond to neuroleptics in a similar manner to that observed in patients. However, neuroleptic therapy may exhibit therapeutic state dependency as it has the potential to both restore (IR animals) and induce (MD and social controls) deficits in function. All experiments reviewed by university ethics committee. Supported by SFI and Wyeth

POSTER 30

Determination and characterization of coma deepd levels from analysis of EEGs with statistical and deterministic methods

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With the objetive of characterize and determinate different levels of coma deep we focus our work in the study of electroencephalograms (EEGs) of patients with several brain damages. This work supose a improvement in the diagnostic capicity and decission of treatment. To carry this objetive out we have studied EEGs focusing on the functional connectivity between several areas in brain to find possible anomalies in the functional coupling between damaged areas taking as a reference healthy persons EEGs. This analysis has been covered from a point of view of both statistical and deterministic. We have employed partial spectral coherence and a recent method based on autorregresive models, directed transfer function (dDTF), as stochastic tools. We have considered the recordings in a deterministic framework to avoid the idea that two structures just interact when are synchronized. Considering the brain as heterogeneous network of dymamical systems that interact each other, we have been able to valuate the macroscopic representation of the cortico-cortical functional connectivity. Each electrode is treated as a local dynamical system whose interaction parameters provide the connectivity and where dimension of the phase space associated is a good stimator of the complexity of each brain state. The study of EEGs from 15 patients has allowed to stablish algorithms to diferenciate automatic and roboustly states like open-close eyes, repose and several brain damages.
Work supported by Grants EU-IST-2001-34892, EU-IST-2001-34893, CICYT SAF2002-10935-E, CICYT SAF2002-10934-E, CAM 8.5/30/2003 and BEFI02/1767.

POSTER 31

Chronic hyperammonemia alters the neurochemical and motor responses to activation of metabotropic glutamate receptors in the nucleus accumbens of rats *in vivo*.

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One of the neurological complications in hepatic encephalopathy is the impairment of motor coordination and function. Hyperammonemia is considered the main factor responsible for the neurological alterations found in patients with hepatic encephalopathy due to chronic liver disease. Activation of metabotropic glutamate receptors (mGluRs) in the nucleus accumbens (NAcc) induces locomotion in rats. We studied whether the control of motor function by mGluRs in the NAcc is altered in hyperammonemic rats. The locomotor activity induced by injection of DHPG, an agonist of the group I (mGluR1 and 5) metabotropic glutamate receptors into the NAcc *in vivo* was significantly increased in hyperammonemic rats and was accompanied by a stronger expression of the immediate early gene (IEG) c-Fos in the NAcc of these rats. We then investigated the neurochemical changes in the NAcc induced by the stimulation of group I mGluRs. DHPG increased extracellular dopamine but not glutamate in the NAcc of control rats. In hyperammonemic rats, DHPG-induced increase in dopamine was significantly reduced, and extracellular glutamate increased 6-fold. The content of mGluR 1 receptors but not of mGluR 5, is increased in the NAcc of hyperammonemic rats. Blockade of mGluR 1 completely prevented motor and neurochemical effects induced by DHPG. These results show that modulation of both motor function and extracellular concentration of neurotransmitters by group I mGluRs in the NAcc is altered in hyperammonemia. This may contribute to the alterations in motor function in hepatic encephalopathy.

POSTER 32

Computerized system to train and evaluate visual delayed recognition in macaque monkeys

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A custom-built system was used to train and evaluate visual memory in adult macaques. The system had the following elements: 1) front panel, facing the monkey, with three round windows arranged as a triangle, 2) one pressure key below each lower window, 3) liquid reward tube, 4) a computer running custom-made applications to train, monitor and measure the monkey's performance, and 5) two screens, one behind the windows, used to present the sample and choices to the monkey, and the other one for researcher's work. The system was suitable to train an adult male monkey on a task where he had to make a choice following sample presentation in the upper window. Two samples were used: a circle and a cross. The following sequence of tasks was adequate to train the monkey: 1) reward retrieval, 2) key pressure followed by reward, 3) sample and single choice presentation – key pressure – reward on correct position, 4) sample and single choice presentation – key pressure – reward on correct image choice, 5) sample image presentation – two choices – key pressure – reward, 6) sample image presentation - delay with no sample nor choices presented – two choices – key pressure – reward.

POSTER 33

Twenty-Four hour sleep fragmentation impairs learning in an extra-dimensional set-shifting task.

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Introduction: Sleep fragmentation is a common symptom in several sleep disorders and has been shown to lead to daytime sleepiness and cognitive/memory impairments, even when total sleep time may not be greatly diminished. The effect of a sleep interruption (SI) schedule on an attentional set-shifting task in rats was investigated.
Method: Young-adult Male Sprague-Dawley rats were initially trained on tasks in which the reward was consistently associated with the same stimulus dimension. After training, a new version of the task was presented in which the reward was now associated with the previously irrelevant stimulus. SI was produced using an automated rat treadmill operating on a cycle of 30s on and 90s off, for 24-hours. An exercise control for SI was produced using a treadmill cycle that allowed deep sleep, but required an equivalent amount of exercise. Both groups were compared with a cage control group that experienced neither sleep interruption nor treadmill exercise. We hypothesized that the sleep fragmentation would lead to an impairment in set-shifting performance.
Results: Rats that underwent 24-hour sleep interruption took significantly more trials to achieve criterion performance than either of the two control groups. The non-exercise cage-controls displayed intermediate performance. Interestingly the 24-hour exercise control group reached criterion significantly more quickly that either the SI or cage-control groups.
Conclusion: 24h of sleep fragmentation produced an impairment in attentional set-shifting that is comparable to the cognitive deficits observed in humans after a night of experimental sleep interruption. Future studies will examine the biological basis of the behavioral effects described. The use of the SI paradigm to model sleep disorders and occupational sleep loss, and the potential to test therapeutic interventions are discussed.
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POSTER 34

Spatial learning deficits in middle-aged mice: correlation with social and emotional behaviour and brain levels of neurotrophins

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Aim of this research was to study the effects of ageing on the overall neurobehavioural profile and learning abilities of CD-1 mice. Thirty middle-aged CD-1 male mice (about 13 months of age) were subjected to a battery of behavioural tests (plus-maze, open-field test, social interaction, Morris water maze) and their performance compared with that of 30 young mice (about 7 months of age). Results indicate that important differences in emotional, social and cognitive abilities are already evident in 13-months-old mice. A factorial analysis applied to these data revealed that, compared to adult subjects, in middle-aged mice greater anxiety was accompanied by subtle deficits in spatial learning and a greater rigidity in social interactions leading to a subordinate role. By contrast, the ability to attain dominance in middle-aged mice, but not in adults, was predictive of a better performance in the Morris water-maze test and reduced neophobia, as shown by reduced thigmotaxis and shorter latency to contact an object in the open-field test. BDNF, but not NGF levels were positively correlated with measures of exploration and with the ability to learn a spatial task in adult subjects. These correlations were absent or reduced in middle-aged subjects, suggesting that deficits in behavioural plasticity emerge early in mice, in the absence of overt sensory-motor impairments.
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POSTER 35

Investigation of the spatial and temporal control mechanisms of the hippocampal CA1 microcircuit: a computer model of dynamic heterassociative memory.

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A detailed compartmental model of a hippocampal CA1 pyramidal cell that contains known channel types and distributions (Poirazi

et al 2003; Neuron, 37:977-987) has been constructed using the NEURON software simulation environment. Coupled AMPA and NMDA synapses have been incorporated into the model to represent the excitatory afferent pathways from the CA3 region and entorhinal cortex onto the pyramidal cell. GABAergic input from four known types of hippocampal interneurons have been modelled: bistratified, axo-axonic, basket and horizontal cells. The axons of each of these interneurons synapse onto different domains of the postsynaptic pyramidal cell. This target selectivity infers a functional significance (Buhl et al 1994; Nature 368:823-368).
The hippocampus is known to be crucially involved in associative memory function. In particular, the CA1 sub-region has been postulated as a suitable substrate for heterassociative episodic memory (Paulsen and Moser, 1998;TINS;21:273-278). Precisely how it performs this memory task is not fully understood. The computer model is being used to explore the influence of various intrinsic cell membrane properties on the cell's ability to recognise patterns of excitatory input. This ability is fundamental to a network of pyramidal cells being able to act as an associative memory. Initial tests results demonstrate that the cell can discriminate between different levels of excitatory population input, though the active membrane properties need to be tuned for optimal performance (cf Graham 2001;Network, 12:473-492). Pattern recognition was also improved when excitatory input was asynchronous over a period correlated with gamma oscillations. It is being investigated whether the spatial control mechanisms associated with the local interneuron microcircuit can aid pattern recognition and also act to switch the cell dynamically between storage and retrieval modes of operation.

POSTER 36
Bilateral effects of unilateral lesions in aphasia : an fMRI study

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In normal subjects speech processing involves both hemispheres, and yet aphasia occurs after purely unilateral left lesions, suggesting a specific role of the left hemisphere in speech processing. In addition, however, the left lesion may disrupt processing within the intact right hemisphere. We have investigated the latter hypothesis in aphasic patients using the auditory processing streams as model (Maeder et al. 2001). Brain activations associated with sound recognition or localisation was investigated using fMRI (1.5 Tesla Siemens Vision; as in normal subjects: Maeder et al. 2001). In normal subjects, the activation pattern on temporo-parieto-frontal convexity differed in the two conditions: middle temporal gyrus and precuneus bilaterally and posterior part of left inferior frontal gyrus were activated specifically by sound recognition; and lower part of inferior parietal lobule and posterior parts of middle and inferior frontal gyri by sound localisation. From 6 patients, 2 male 4 female, aged 30 to 65 years, with focal lesions in the left hemisphere, 2 were deficient in sound localisation, and/or sound recognition. and four were normal at the time of the fMRI investigation. Auditory information activated spared parts of the left hemisphere. In the non-damaged right hemisphere parts of the temporo-parieto-frontal cortex were activated, but less than in normal subjects. Recognition or localisation, versus rest, activated Heschl's gyrus and varying extent of surrounding cortex. The specialised processing pathways for sound recognition and localisation were, however, not activated by specific tasks as in normals. These results suggest strongly that aphasia canot be interpreted solely as the dysfunction of the left hemisphere. Unilateral left hemispheric damage disturbs significantly auditory processing within the contralateral, spared hemisphere.
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POSTER 37
Reinforcement learning signals predict future decisions

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Biological and social survival necessitates the ability to flexibly adjust decision-making strategies in response to recent outcomes. Reinforcement learning theory provides a mathematical framework for characterizing how reinforcements are used to guide future decisions, but little is known about the neural mechanisms of this process. Here, we used event-related potential (ERP) recordings to examine how people use reinforcements to guide their future decisions. In the experiment, subjects played a competitive game against a computer opponent and had to strategically use feedback to update their decision-making strategies in order to maximize rewards. Examination of ERPs elicited during feedback processing revealed an enhanced negative deflection of the ERP approximately 300 ms following losses compared with wins (the error related negativity; ERN). However, as predicted by reinforcement learning theory, evaluation of the current reinforcement also reflected the process of using reinforcements to guide future decisions. Specifically, larger ERNs following losses predicted that subjects would switch (as opposed to perseverate with) their decision on the following trial. This predictive activity was not observed following wins. We constructed a computational model of the dopamine system, based on principles of reinforcement learning theory, to test the hypothesis that this predictive brain activity reflects dopaminergic reward prediction error signals. The model behaved similarly as did human subjects during the task, and generated reward prediction errors that, similar to the ERN, both reflected the current reinforcement and predicted the model's decision in the subsequent trial. These findings demonstrate that neural processes during reinforcements reflect how those reinforcements guide future decisions, and suggest that dopaminergic reward prediction error signals is the neural mechanism for this process.

POSTER 38

Degradation of APP during the early phase of long-term memory consolidation.

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Amyloid precursor protein (APP) is required for memory formation however its functional significance is unknown. We now demonstrate learning-dependent degradation of APP in the rat hippocampal dentate gyrus to be an essential feature of memory consolidation. Neuron-specific APP695, the dominant form in the brain, expression became significantly reduced at the 2h (79.71± 3.58%; $p<0.001$) and 4h (84.56 ±3.13%; $p<0.001$) post-training times as compared to naive untrained APP levels. A similar reduction in CSF soluble APP was observed 2-4h post-training (2h: 49.92±13.56%; $p=0.0423$ and 4h: 38.62±2.87%; $p=0.0047$). Co-immunoprecipitation studies revealed APP695 to be associated with the adaptin protein (AP) 2 and, separately, that AP2 increased its association with AP180 in the 2-4h post-training period. Collectively, these observations suggested APP695 to be internalised for degradation by clathrin-coated pits. Glial-specific APP, containing the Kunitz protease inhibitor (APP-KPI), also became internalised in the 2-6h post-training period (2h: 77.87±4.89%; $p<0.05$, 4h: 75.85±10.35%; $p<0.05$ and 6h: 72.74±1.81%; $p<0.05$) but, by contrast to APP695, appeared to become internalised by association with the low-density lipoprotein receptor-related protein (LRP). This latter suggestion is based on the observation that the receptor antagonist protein (RAP), when administered at 3h following training, resulted in task amnesia and prevented APP-KPI degradation. APP degradation was not observed in the CA regions and may have a role in synaptic restructuring of the perforant path input.

Supported by the Health Research Board of Ireland. CMR and KJM are Science Foundation Ireland Investigators.

POSTER 39

A Model of Repetition Blindness

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Various psychological phenomena require the establishment of separate episodic representations for each of the objects perceived in the environment. From the point of view of the brain these representations need not be stored in the same place, but may be distributed over many regions. Indeed, there is neurobiological evidence supporting the theory that the episodic context of an object is stored separately from its identity. We describe a model of one such phenomenon which uses separate representations for the identity and location of letter information.

Repetition blindness (RB) is the failure to detect the repeated occurrence of a stimulus which is presented in a rapid *serial visual presentation* experimental paradigm. If the exposure of the first occurrence of the stimulus is set so that it is just identifiable-about 100 ms-then identification of the second occurrence is impeded.

The distinction between types and tokens is well known in language and is critical to the understanding of language and perception in general. It has been proposed that RB occurs when words are recognised as separate types but not tokenised, hence the description *type activation without token individuation*. Normally, as each word is presented separate type and token nodes are setup with links established between the two to tokenise the type.

One possible source of this type-token division is the segregation of the visual system into “what" and “where" pathways. In this view the identity information is processed ventrally in the “what” system and the episodic details are processed dorsally in the “where” pathway. This, though, leaves the problem of how identity and episodic information can be kept together if they are processed in distinct cortical regions. This is an instance of the binding problem. One popular proposal is that the brain uses the synchronisation of neural spikes in groups of neurons, known as cell assemblies, to solve this problem.

Drawing on the presence of the functional streams in the visual cortex, the model of repetition blindness proposed in this thesis follows this roughly Y-shaped division. It consists of three networks of interconnected self-organising maps of excitatory and inhibitory spiking neurons. These are capable of discharging in a synchronous oscillatory fashion.

It is proposed that RB arises at short stimulus onset asynchrony due to a period of quiescence after ignition of the initial response in the network. The silence was caused by a burst of inhibitory spikes which introduced a temporal blind spot. If a stimulus was presented when the network was in one of these blind spots it was effectively blind to it. This blind spot was only apparent when identical stimuli were rapidly presented to the network. At longer presentation rates or where the stimuli were different, the blind spot did not develop. The network produced this behaviour when the stimuli were presented in either the same or different locations.

POSTER 40

Neuropsychology and magnetic resonance imaging in paediatric temporal lobe epilepsy: impact of pathology type.

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Background: Temporal lobe epilepsy in childhood is associated with two distinct types of pathology affecting primarily hippocampal (hippocampal sclerosis - HS) or cortical (dysembryoplastic neuroepithelial tumour -DNET) temporal lobe structures. It is predicted that these will have a distinct impact on memory function. Furthermore, we evaluated the impact of these two pathologies on grey matter density across the whole brain using voxel-based morphometry (VBM).

Participants: 30 children with HS (mean age 12.1 years), 20 with temporal DNET (mean age 12.6 years), and 22 healthy controls (mean age 12.9) were recruited.

Methods: Children underwent neuropsychological evaluation of verbal and figural memory and intelligence. 3D T1 weighted MRI scans were also obtained. Lesions were outlined using MRIcro, and excluded from subsequent normalisation and analysis steps using SPM99.
Results: Neuropsychologically, the HS group was at increased risk of both semantic and episodic verbal memory impairment compared to the DNET group, regardless of the laterality of damage. Children with HS showed significant grey matter density reductions in the thalamus, temporal neocortex and cingulate, consistent with hippocampal targets. Despite lesions affecting medial portions of the temporal lobe, the left DNET group showed no significant reductions in grey matter density. The right DNET group had reductions only in the thalamus.
Conclusions: Children with HS are at increased risk of memory impairments compared to those with DNET pathology. The more widespread grey matter reductions seen in children with HS may be linked to the lack of functional hippocampal input during development, and may help to explain the memory deficits seen in this population.
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POSTER 41
A computational model of recognition memory in perirhinal cortex: a critical role for complex conjunctive representations

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It is widely accepted that the perirhinal cortex (PRh) is involved in visual recognition memory; many studies using the delayed non-matching-to-sample and spontaneous object recognition paradigms have revealed recognition memory impairments in animals with lesions in PRh (Meunier et al.,1993; Winters et al.,2004).
More recently, some have argued for an additional role of PRh in perception. Evidence for this comes from visual discrimination studies in which PRh-lesion performance deficits have been revealed by increasing the perceptual difficulty of the discriminations (Buckley et al.,2001). In particular, Bussey and Saksida (2002) have proposed that PRh is critical for discrimination problems possessing a high degree of feature ambiguity, that is, problems requiring the use of representations of the configurations of features comprising the stimuli, since a solution is not possible by considering the features in isolation.
The present study examines whether this account of the role of PRh in visual discrimination can be applied to the function of PRh in recognition memory. A computational model of recognition memory is presented in which complex conjunctive stimulus representations, present in PRh, and simpler representations of stimulus features, housed in earlier regions in the ventral visual stream, are encoded on first presentation of a stimulus and later recalled. Data from the model demonstrate that a delay-dependent recognition memory deficit can be simulated by removal of the PRh layer from the network. Further simulations show that recognition memory performance is similarly impaired by PRh lesions at short delays when the perceptual similarity of visual stimuli is increased (Eacott et al.,1994). Thus the proposed function of PRh in resolving feature ambiguity between complex stimuli can account for deficits observed in recognition memory and visual discrimination following PRh lesions.

POSTER 42
Cyclooxygenase and Synaptic Plasticity

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The advent of selective cyclooxygenase-2 (COX-2) inhibitors has lead to a recent resurgence of interest in COX-2, in particular its role in the brain. Since COX-2 is particularly prevalent in cortex and hippocampus this study has focused on its role in high-frequency stimulation induced long-term potentiation (HFS-LTP) in the perforant path. COX2 has been localised previously to dendrites and dendritic spines of excitatory neurons, structures involved in synaptic signalling and plasticity. In contrast to its inducible role in the periphery, COX-2 is expressed at basal levels in these structures and is rapidly upregulated in response to seizure or NMDA-dependent synaptic activity. Broad-spectrum COX inhibition, with ibuprofen, has been shown to block LTP and cause substantial deficits in spatial learning in the watermaze. By contrast, indomethacin, a relatively selective COX-1 inhibitor, appears to be without effect on LTP induction in vitro or in vivo, whereas selective COX-2 inhibitors NS398 and nimesulide both reduce the probability and magnitude of LTP induction in vitro. Furthermore, NS398 has been shown to cause retention deficits in the watermaze. Thus the effects of COX inhibition are thought to be predominantly a COX2 phenomenon. Here we show that celecoxib, a highly selective inhibitor of COX-2, but not Sc560, a selective COX-1 inhibitor, significantly reduced the probability and magnitude of LTP induction after HFS in the medial perforant pathway, in vivo. By contrast, celecoxib does not affect the maintenance of LTP when given post LTP induction. We conclude that the COX-2 signalling pathway plays a crucial role in the induction but not maintenance of synaptic plasticity in vivo in a PGE2 dependent manner.

POSTER 43
Brain activity mapping in mice during classical conditioning and roughness discrimination task.

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Mystacial vibrissae of rodents are active during exploratory and discriminative behaviour. There is one-to-one correspondence between vibrissae on the snout and barrels in the first somatosensory cortex area. Sensory experience and learning modifies func-

tional properties of neurons in the barrel cortex (functional plasticity). We investigated the activity of the barrel cortex and other brain regions in mice during two types of learning: during roughness discrimination task and during classical conditioning training. To visualize the level of the activation of the brain during both types of training we used [^{14}C]-2-deoxy-D-glucose functional activity mapping. The mapping was performed during the first and the third session of classical conditioning training involving whiskers stimulation on one side of the snout paired with aversive or appetitive unconditioned stimulus. In the roughness discrimination task the mice were trained to distinguish between two discriminanda (sandpaper of different surfaces) with their vibrissae.
During the first session of classical conditioning training, an increased 2DG uptake was seen in the barrel cortex in both hemispheres. In the third session activation of the barrel cortex was unilateral, as expected after unilateral whisker stimulation. We have shown that unilateral sensory stimulation in the initial stage of conditioning activates primary sensory area in both hemispheres. The results suggest that during the early phase of conditioning, the interhemispheric interactions are enhanced. We also found that barrel cortex is highly involved in the roughness discrimination task. The barrelfield had the highest metabolic activation in mice, which have not reached the criterion level of performance yet. We presume that high activity of the cortex is particularly needed during active phase of acquiring and learning.
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POSTER 44
Evidence of crosstalk between spatial and habit memory systems

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The bilateral intranigral infusion of 1 µmol 1-methyl-4-phenyl-1,2,3,6-tetrahydropyridine (MPTP) in adult male Wistar rats caused a specific and partial loss of substantia nigra pars compacta (SNc) dopaminergic neurons, a partial depletion of striatal dopamine, and a deficit in learning the cued version of the Morris water maze. Pre-training the SNc-lesioned rats in a spatial version of the water maze or simply maintaining the animals on the water maze platform reversed the deficit. However, the deficit was not reversed neither by maintaining the animals on the platform if the spatial cues were covered with a curtain nor by sessions of swimming in the maze without the escape platform even without the curtain. These results suggest that the spatial memory system can upload information to the habit memory system to compensate learning if a component of basal ganglia is damaged. This interpretation encourages cognitive training to compensate for memory deficits in Parkinson's disease patients.

POSTER 45
The Human Frontal Eye Fields: Involvement in Visual Encoding and Preparation of Finger Movements?

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Apart from the control of eye movements, the frontal eye fields (FEF) are discussed to be involved in a number of other functions. For example, the FEF are assumed to play an important role in visual encoding and the guidance of spatial attention. Sometimes, the FEF are also assumed to establish a salience map of visual scenes to guide further detailed visual analyses of relevant objects. In a previous functional magnetic resonance imaging (fMRI) study, we investigated the interference of visual encoding and action preparation processes. In that study, we found evidence that the FEF are engaged in both difficult visual encoding processes and preparation of finger movements. The aims of the present fMRI experiment were twofold. First, we wanted to investigate the potential overlap of activations elicited by eye movement control, visual encoding, and motor preparation. Second, the present experiment tested the salience map hypothesis by parametrically varying task difficulty during encoding. In the present experiment, participants performed three different tasks in counterbalanced order. An eye movement task was employed for individual localization of the FEF. In addition, participants performed a visual task where grey bars with varying contrasts were presented. Participants had to judge the orientation of these bars. Finally, a motor task was employed where auditorily cued finger movements with varying difficulty had to be executed.

POSTER 46
Memory for emotional events. The effects of stress hormone activation on memory consolidation in man

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Following an emotional event, stress hormones released by the body stimulate the central noradrenergic system which activates the amygdala. Amygdala activation modulates other brain regions involved in memory consolidation. Recent research indicates that stress hormone activation induced after viewing emotional material interacts with the degree of arousal at encoding to enhance memory for that material. For example, administration of adrenaline or *Cold Pressor Stress ((CPS)* a reliable stress hormone inducer), immediately after viewing emotional material, have both been found to enhance memory of that emotional material. However, disparities in this field of research have emerged: using identical stimuli and closely matched methodology, subsequent research has found that noradrenergic system stimulation did not enhance memory consolidation of emotional material. This present study aims to further investigate whether 'post learning stress' interacting with

arousal at encoding enhances memory of emotional events. 60 students (33 female 27 male) viewed an emotionally arousing slide presentation, consisting of 11 slides with a neutral beginning and an emotionally arousing middle phase (slides 5 to 8). Immediately following this, half the participants were administered CPS, which involves submerging one's hand in ice cold water. The other half submerged their hand in lukewarm water (control condition). One week later participants were given a free recall and recognition memory test on the slide presentation. Both control and *CPS* groups showed enhanced memory for the emotionally arousing phase in comparison to the neutral phase. However, there was no differential effect of *CPS* relative to control for the emotional phase. Although the results of this study are not easily reconcilable with some previous research they are not an isolated anomaly and highlight the need for further thorough investigation if 'post learning stress interacting with arousal at encoding to enhance memory' is to be considered a real and replicable phenomenon

POSTER 47

Short- and long-term effects of rewards on the deployment of visual selective attention

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Outcomes of actions, in the form of rewards and punishments, are known to shape behavior. As a result, adaptive behaviors are reinforced at the expenses of competing ones, thus increasing fitness of the organism with its environment. However, it is unknown whether similar influences also regulate covert mental processes, such as Visual Selective Attention (VSA). VSA underlies goal-directed performance by allowing privileged processing of task-relevant information, while inhibiting distracting contextual elements. Using variable monetary rewards as arbitrary feedback on performance, we tested whether acts of attentional selection can be modulated by their consequences. In a typical VSA task, we observed sensible trial-by-trial adjustments of the working of selective attention as a function of the reward value received in a preceding trial. Lingering inhibition of distracters was robust after highly rewarded responses, while it was eliminated after poorly rewarded selections. In order to further test whether rewarding feedbacks may affect the longer-lasting consequences of VSA deployment, we trained subjects to perform a VSA task where the probability of receiving a high or low reward value as a feedback was biased for specific items. While each item was used the same number of times as target or distracter, and the overall probability of receiving either reward value was 50%, some of the experimental stimuli had a much greater probability to lead to a high reward when correctly selected or ignored. The effects of such training were tested after a five-days delay, through a variety of VSA tasks. The collected evidence suggests that indeed the history of success, in terms of awarded monetary gain, in selecting or ignoring specific items affects the way VSA will be applied in future encounters with the same objects. Our findings reveal an adaptive feature of VSA that may provide attentive processes with both flexibility and self-regulation properties.

POSTER 48

Varieties of impulsivity and response to novelty and amphetamine: a differential analysis in the rat.

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Impulsivity and sensation-seeking are tightly related in several psychiatric disorders like addiction or attention deficit-hyperactivity disorder. This relationship has been assessed in rats by considering the multifactorial nature of impulsiveness. We classified rats according to their scores in 3 tests for impulsivity with varying degrees of behavioral inhibition, timing and motor vs. cognitive impulsivity demands: a fixed consecutive number schedule (FCN8), (ability to terminate an action to reach a goal); a multiple fixed-interval/extinction schedules of reinforcement (FI EXT) (inaccurate responding); a test assessing choice between an immediate vs. a larger delayed reinforcement. The relationships between impulsivity and locomotor response to novelty and amphetamine were then studied in a circular corridor, a model of sensation-seeking.
Large interindividual differences in impulsivity were observed in all tasks, but only a few relationships could be evidenced between them: rats that could inhibit responding during extinction were also non impulsive in the FCN8 task and impulsive rats in the FI task were significantly more active during time-out periods in the choice of reward task. No significant relationship could be found between reactivity to novelty and impulsivity scores. However, impulsive rats in the FCN8 task presented a much higher and longer lasting increase in amphetamine-induced locomotion.
This study confirms the multidimentional nature of impulsiveness and demonstrates that only impulsive rats in a task involving both behavioural inhibition and timing, exhibit a higher locomotor response to amphetamine, a characteristic of rats predisposed to amphetamine self-administration and related to a higher limbic dopaminergic activity. The study of those particular individuals could better reflect the impulsive/sensation seeking trait in humans and may thus be of great interest to modelize its related psychopathologies.
Supported by CNRS, Université Bordeaux2

POSTER 49

Electrophysiological indexes of object-based visual selective attention

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Many neuroimaging and neurophysiological studies have provided strong evidence of selective attention mechanisms based on conjoined object and space properties. They are thought to modulate the activity of ventral (what) and dorsal (where) streams of visual pathways. Recent studies suggested an unlikeness in the way different shapes or visual images are coded according to their semantic category by distinct brain regions. In our study, we further investigated the selection mechanisms by means of the conjoined

selection of spatial and non-spatial features. We presented spatially lateralized pairs of stimuli that could be either both not-living (objects), or living entities (animals), or mixed images (distractors). The task consisted in paying attention and respond to a shape category within a visual field and to ignore all the other stimulus combinations. ERPs were recorded from 30 scalp sites in 18 healthy adult volunteers. RTs to all stimuli were also recorded in a choice RT task. We found that attention to both spatial and non-spatial features was able to modulate the early electrophysiological components C1 (60-100 ms) and P1 (120-140 ms) over occipital and lateral occipital areas, both in conjunction or independent of each other. Moreover, attention modulated differently later ERP components at the parietal and central sites. Indeed, an earliest P3-like response (365 ms) was modulated by location relevance *per se*. In addition, a later negativity (428 ms) and a later positivity (470 ms) were modulated both by shape-relevance *per se*, or by the conjunction of shape and location relevance. Overall, these data seem to be consistent with a theory of visual attention suggesting that the two visual streams process visual spatial and object features relevance independently from each other, and that the stage of selection depends on the processing load, occurring at early levels with higher loads and at later levels with lower loads.

POSTER 50

Effect of environment and clozapine on basal and stimulated medial prefrontal GABA release in two rat models of schizophrenia

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In the present study we employed microdialysis in the medial prefrontal cortex (mPFC) to investigate the effects of chronic clozapine treatment on basal and KCl-stimulated GABA release in the isolated rearing and maternal deprivation rat models of schizophrenia. In the isolated group young adult rats were weaned on postnatal day 25 (P25) and individually housed while the maternally deprived group experienced a single 24-hour period of maternal deprivation on P9. A socially reared group acted as controls.
Basal dialysate GABA levels (nM) did not differ significantly in vehicle treated social controls and isolated rats (32±11 (n=7) and 28±11 (n=7) respectively) but were significantly elevated in the maternally deprived group (57±15 (n=6), p=0.038 v's control). Intra-mPFC KCl (100mM, 20mins) rapidly increased local GABA release in vehicle treated social controls, isolated and maternally deprived rats to 80±19, 95±29 and 177±44 respectively. Chronic clozapine (5mg/kg i.p. daily for 10 days) had no effect on basal GABA levels in control or isolated rats but reversed the elevated basal GABA levels to control levels in the maternally deprived rats (p=0.004 v's control). Clozapine had no effect on KCl-stimulated GABA release in any of the groups.
Thus, maternal deprivation on P9 is associated with a basal and KCl-stimulated *hyperGABAergia* in the mPFC which may form the neurochemical basis for behavioural abnormalities previously observed using this animal model. Furthermore, the finding that clozapine reverses basal *hyperGABAergia* in the mPFC suggests that GABA may be a useful target in the development of novel antipsychotic agents.
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POSTER 51

Role of the neurokinin-3 receptors in the modulation of behavioral and neurochemical effects of acute cocaine

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While most of the research of cocaine's mechanisms of action has focused on monoaminergic systems, little is known about its interaction with other transmitters and neuropeptides. Several lines of evidence point to a role for neurokinin-3 (NK-3) receptors in reinforcement mechanisms. We investigated the effect of antagonism of NK-3 receptors on reinforcement and hyperactivity induced by cocaine in a conditioned place preference paradigma and on the dopaminergic activity in nucleus accumbens core and shell of freely moving rats using in vivo microdialysis. NK-3 receptor antagonism blocked the reinforcing and hyperlocomotor effects of acute cociane administration and potentiated the increase in extracellular levels of dopamine in the nuclues accumbens core. These data provide evidence for a important contribution of NK-3 receptors to cocaine-induced behavioral and neurochemical effects.
This work was supported by the DFG

POSTER 52

Integrated Memory for objects, places and temporal order: evidence for episodic-like memory in mice

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As above.

In its narrowest sense human episodic memory refers to the recollection of the spatio-temporal context of unique events. Towards the goal of an animal model of episodic memory, we designed a three-trial task in which different versions of the novelty-preference paradigm, were combined to subsume a) object recognition memory, b) the memory for locations in which objects were explored, and c) the temporal order memory for objects. We found that the mice spent more time exploring two old familiar objects relative to two recent familiar objects, reflecting memory for *what* and *when* and concomitantly directed more exploration at a spatially displaced old familiar object relative to a stationary old familiar object, reflecting memory for *what* and *where*. According to the currently discussed behavioral criteria for episodic-like memory in animals, our results suggest that mice are capable to form such higher order memories by integrating what, where and when information.

POSTER 53

Neurochemical correlates of behavior of marmosets (*Callithrix penicillata*) exibited during predator confrontation: evidence for brain lateralization

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Due to the closer phylogenetic proximity to humans, non-human primates can provide advantages over rodent models. A method for measuring anxiety and fear in marmosets (Callithrix penicillata) is the Marmoset Predator Confrontation Test. It has been shown to be sensitive anxiolytics and Substance P. A detailed behavioral analysis was conducted in marmosets together with *ex vivo* neurochemical analysis in several brain area in both hemispheres using HPLC-ED and plasma levels of cortisol, testosterone and adenocorticotrophic hormone (ACTH) by immunoassay. Correlative analyses were conducted between the behavioral, neurochemical and endocrinological measures. The results indicate a complex interactions between behavioral and neurochemical measures and provide evidence for neurochemical/behavioral brain lateralization in this species.
This work was supported by CAPES/DAAD/PROBAL and DFG

POSTER 54

Face recognition in AMD patients

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Objective: Age related Macular Degeneration (AMD) is a major cause of blindness in people over 50 years. AMD patients display difficulties in reading and recognizing faces. The face recognition is allowed by two different brain processes: the featural processing and the holistic processing. The featural processing is the ability to recognize a facial component as belonging to a friend or relative. Our Study is designed to understand the effects of loss in contrast sensitivity and high spatial frequencies on featural processing and face recognition.
Method: Healthy subjects were tested in six tasks requiring different types of processing: (1) discrimination of face/non-face, (2) discrimination of gender, (3) discrimination of known/unknown faces, (4) discrimination of facial component/non-facial component, (5) categorisation of facial component and (6) a specific test for the featural processing.
The contrast of grey-level photographs of faces and facial components (nose, eyes and mouth) was manipulated in order to simulate the loss in contrast sensitivity of AMD patients. From each original photograph the contrast was divided by 2, 4, 8, 16, and 32.
Results: For healthy subjects the results show that: (1) the decrease in contrast does not affect the face/non-face discrimination task, (2) gender discrimination requires 9% of the original contrast and (3) face recognition requires at least 16% of the original contrast. (4) The facial components/ non facial components discrimination requires 8% of the original contrast, (5) facial component categorisation requires 18% of the original contrast and (6) the featural processing requires 40% of the original contrast.
Conclusions: Our results suggest that difficulties in face recognition in AMD patients are, to a large part, due to their loss in contrast sensitivity. The featural processing disappears rapidly with the contrast reduction.

POSTER 55

A motion sensitive area in the ferret suprasylvian cortex and its role in motion perception

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Using electrophysiological single unit recordings in the extrastriate cortex of anesthetized and paralyzed pigmented and albino ferrets (Mustela putorius furo) we identified an area that is characterized by a high incidence of motion and direction selective neurons. This area is located in the posterior bank of and immediately posterior to the suprasylvian sulcus thus being bordered by the auditory cortex anteriorly, area 21 posteriorly, posterior parietal cortex medially, and area 20b and PS laterally.
Neurons in this posterior suprasylvian area PSS preferably respond to random dot patterns moving in frontoparallel directions as well as in depth (contraction – expansion). Of all neurons recorded, 81% in pigmented and 65% in albino ferrets were direction selective, i.e. their response during movement in the preferred direction was at least twice as strong then the response in the non-preferred direction. Directional tuning of PSS neurons in albino ferrets was significantly broader than in pigmented ferrets.
In a behavioural approach, ferret's ability to perceive visual motion was tested. Animals were trained in a forced choice two alternative discrimination task where they had to distinguish between two dot patterns differing in the amount of coherently moving dots. All ferrets were able to solve the task. However, the detection threshold i.e. the amount of dots moving coherently in the same direction in order to be distinguished from a randomly moving dot pattern was significantly higher in albino than in pigmented ferrets.
In order to evaluate the role of area PSS for motion detection lesions of area PSS were performed and the animals were retested in the motion detection paradigm. After lesion of area PSS the detection threshold of all animals were significantly higher than before lesion. By contrast, lesions including area 21, 19 and parts of area 18 and 17 had no significant effect on motion detection performance.
Thus, ferret area PSS resembles cat area PMLS and monkey area MT with respect to neuronal response properties and its role in motion perception.
Supported by DFG grant SFB 509-A11

POSTER 56

Effect of D1- and D2-dopamine-receptor antagonists on sequential behavior in the rat.

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Sequential learning, a type of procedural learning, has intensively been investigated in humans. This work has mainly been done using so-called serial reaction time tasks (SRTT), in which subjects have to respond rapidly to simple visual stimuli by pressing a response key. Unknown to the subjects, these stimuli can follow a specific repeating sequence. Learning of such a sequence is typically inferred from faster reaction times to sequence as compared to random blocks. In rodents, the analysis of sequential behavior has not received considerable attention. However the implementation of a comparable sequential paradigm in rodents would be highly desirable, since it would allow detailed analyses of the underlying brain mechanisms, especially of cortico-striatal networks.
Here, we describe the development and application of an instrumental task in rats which is designed similar to the human one. Rats had to respond to visual stimuli within a limited time-period by nose-poking in order to obtain food-reward. We displayed these stimuli either in a random or a sequential fashion and compared performances (reaction times, accuracy, response rate) of the rats under both conditions. In addition, we investigated the possible and distinct roles of different dopamine-receptor subtypes in serial-responding, and sequential behavior in particular. Data from experiments with sequential manipulations and drug-challenge experiments with 2 different dopaminergic antagonists, namely the D1-receptor antagonist SKF 83566 and the D2-receptor antagonist raclopride, will be presented. These data show how rat performance during serial responding can improve under sequential conditions, and can be modified under blockade of dopamine-receptors, indicating that our rat model of SRTT might be useful to analyse sequential learning, memory, and their underlying brain mechanisms in the rat.
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POSTER 57

The PLA2 stimulator melittin alters dopamine transporter function and trafficking through multiple mechanisms

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The purpose of this study was to examine the effects of phospholipase A2 (PLA2) stimulation and arachidonic acid (AA) signaling on dopamine (DA) transporter (DAT) function and trafficking. We used the PLA2 stimulator melittin to release endogenous AA in HEK cells stably transfected with the DA D2 receptor and the human form of the DAT. Melittin reduces DAT mediated uptake of [^{3}H]DA. This decrease results partially from the prevention of substrate and antagonist binding. Gas liquid chromatography measurements of fatty acid content following treatment confirm that melittin acts as a PLA2 activator by releasing 24.6±0.06% of membrane bound AA. Biotinylation experiments indicate a simultaneous 147.7±8.4% increase in internalization of the DAT compared to baseline levels. This internalization is blocked by cocaine pretreatment. We used confocal microscopy to determine the intracellular location of the internalized DAT by measuring DAT colocalization with markers of intracellular organelles. Melittin causes an increase in DAT colocalization with RAB 5A, and causes a decrease in colocalization with EEA1, RAB 7, and RAB 11. As a comparison the phorbal ester PMA causes an increase in DAT colocalization with EEA1, while not changing colocalization with RAB 7 or RAB 11. Cocaine treatment does not affect DAT trafficking. Thus melittin acts by activating AA signaling pathways and also by affecting binding ability of the DAT.

POSTER 58

Differential effects of full and partial dopamine D_2 receptor agonists on striopallidal gaba-mediated inhibition of subthalamic-pallidal glutamate release in the awake rat.

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Partial dopamine D_2 receptor activation is proposed to be beneficial in treating motor dysfunction in Parkinson's disease without the side effects associated with conventional treatments such as full receptor agonists. Microdialysis was employed in the external globus pallidus (GPe) to compare the effects of an acute oral administration the full dopamine D_2 receptor agonist pramiprexole with three partial D_2 receptor agonists namely, terguride, aripiprazole and -3PPP on local GABA and glutamate release.
Basal dialysate GABA and glutamate levels in the GPe were 21.5±0.8nM and 1.8±0.8µM (n=112). Pramiprexole (0.1 and 0.3mg/kg, *p.o.*) was associated with a prolonged (260 min) dose-dependent reduction in GABA and glutamate release; for GABA: -37±4% ($p<0.001$ *v's* control) and -32±8% ($p<0.01$); for glutamate: -26±10% ($p<0.01$) and -65±27%, ($p<0.001$) respectively. Regarding the partial agonists; terguride (3mg/kg and 10mg/kg) also reduced GPe GABA and glutamate release and the reduction in GABA was more potent at the lower dose, for GABA: -50±9%, ($p<0.001$) and -31±7% ($p<0.01$); for glutamate: 46±13% ($p<0.01$) and -24±7 respectively. Aripiprazole and -3PPP (10 and 30mg/kg, *p.o.*) also decreased GABA release, for aripiprazole: -18±3($p<0.01$), -19±2% ($p<0.05$) and for –3PPP: -14±3% and –21±2% ($p<0.05$) respectively, while glutamate levels were not affected.

While the strong reduction in GPe GABA and glutamate release associated with pramiprexole is also observed following terguride only a moderate reduction in GABA is observed following aripiprazole and –3PPP. We suggest that the reduction in GABA and glutamate release in the GPe reflects the relative potency of these agents to activate a striatal dopamine D_2 receptor mediated inhibition of striopallidal GABA and a subsequent inhibition of subthalamic-pallidal glutamate release. This finding may explain the reduced incidence of dyskinesias associated with partial D_2 receptor activation and may be important in the ongoing search for more effective therapeutic strategies in the treatment of Parkinson's disease.

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POSTER 59

C-terminal fragment of cocaine- and amphetamine- regulated transcript (CART) peptide attenuates the behavioral effects of morphine and psychostimulants

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Cocaine- and amphetamine-regulated transcript (CART) peptide is involved, among others, in feeding, stress, pain and drug dependence. The structure of CART peptide suggests its C-terminal region might be crucial for biological activity. We tested whether C-terminal fragment of CART peptide, ie. L-Abu-DCPRGTS-Abu-NSFLLKCL (CART 85-102), is able to influence selected behavioral effects of morphine, cocaine and amphetamine. Aminobutyric acid (Abu) residues replace two naturally occurring cysteine residues to prevent their pairing.
The peptide was evaluated for its influence on cocaine- and amphetamine-induced hyperlocomotion, morphine-induced locomotor sensitization and morphine withdrawal signs in mice after intracerebroventricular injection. Cocaine was given subcutaneously (sc) at the dose of 15 mg/kg and amphetamine at 5 mg/kg (sc). In the sensitization test, mice were divided into two groups which received morphine (10 mg/kg, sc) or saline, five times at 3-days intervals. On day 20, animals previously treated with morphine received a challenge dose of morphine (10 mg/kg, sc) and the tested peptide. Withdrawal signs (escape jumps) were precipitated by naloxone (4 mg/kg, ip) in morphine-addicted mice.
We found that CART (85-102) attenuates the withdrawal syndrome as measured by the number of escape jumps and inhibits cocaine- and amphetamine-induced hyperlocomotion at the dose of 0.1 µg. The peptide also prevents the expression of morphine-induced sensitization at the doses of 0.05 and 0.1 µg but does not influence spontaneous locomotion alone. The results suggest that CART (85-102) might be able to modify the behavioral effects of morphine and psychostimulants.
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POSTER 60

Evidence for recollection in a task of episodic-like memory in the rat

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Assessing episodic memory (the memory of "what" happened, "where" it happened and in "which" context it happened) in non-human animals has proved problematic due to the absence of language (to demonstrate recollection of the past event). Although work in birds has demonstrated this type of memory, the avian brain is evolutionarily remote from the human brain, and so the task is of limited use in understanding the neural mechanisms of human episodic memory. In the current experiment 16 rats experienced two distinct events in an E-shaped maze and learnt "what" object was located "where" and in "which" context. The animals were then exposed to one of the objects in a separate chamber before being returned to the maze. As rats have an innate preference for novel items they choose to search out the item which they have not been exposed to in the separate chamber. As the objects are out of sight of the animal in the maze, finding the preferred object requires the animal to recollect "what" item is located "where" in the present context ("which"). We believe this to be the first demonstration of recall in an episodic-like memory task in the rat, and present evidence for the involvement of the fornix in this type of memory.

POSTER 61

Effects of birthweight on childhood cognition: a monozygotic twin study

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Research has shown an association between birthweight and cognition, mainly in children with birthweight < 2500g, with few studies considering the entire birthweight range. The monozygotic twin design is well suited to examine the birthweight – cognition link because factors that affect cognition, such as genes, parental IQ & education, social class and gestational age, are matched within pairs. Seventy-one monozygotic twin pairs (41 male; 30 female) were tested, aged 7 y 11 m to 17 y 3 m. Birthweight ranged from 1070 to 3500 g.
The WISC-III and the Wechsler Objectives Numerical Dimensions (WOND) were administered. Mean VIQ, PIQ and WOND scores were in the normal range. We correlated within-pair differences in birthweight (heavier – lighter twin) with within-pair differences in outcome. Birthweight difference correlated with VIQ difference. Examining males and females separately showed that males accounted for the VIQ association. In order to investigate whether these results were consistent over the whole birthweight range, twin pairs were grouped according to the birthweight of the lighter twin, and the correlations repeated. Again, VIQ correlated with birthweight in males when the lighter twin weighed between 1500

– 2499 g. WOND scores were related to birthweight when the lighter twin weighed 2000 – 2499 g. These associations were not found in females.
These results suggest that, when the majority of background variables are controlled, male children with higher birthweights have better cognitive outcome. Lower birthweight may indicate nutritional insult during pregnancy. It is likely that when this affects cognition, it does so by influencing brain development. We have structural MRI scans for much of our sample and plan to follow up these behavioural findings using Voxel Based Morphometry.

POSTER 62

The interaction of V5 and posterior parietal cortex in the processing of conjunction search requiring attention to form and motion.

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Much evidence exists as to the functional role of right posterior parietal cortex (PPC) in conjunction visual search (see Ellison, Rushworth & Walsh, 2003, Clinical Neurophysiology). It is also known that right V5 acts in visual search in which attention to motion is required (see Walsh, Ellison, Batelli & Cowey, 1998, Proceedings of the Royal Society B). The differential involvement of PPC and V5 in motion conjunction and colour conjunction tasks was investigated using Transcranial Magnetic Stimulation (TMS). It would seem that PPC is involved in the processing of a colour conjunction task (as previously demonstrated) but is not critical for the processing of a motion conjunction task. Conversely, V5 has a critical role in the processing of the motion conjunction task but not the colour conjunction task. The differential involvement of these areas in these tasks was also investigated in terms of how they interact; specifically, can disruption of V5 in the motion conjunction task force involvement of PPC processing? This was done using TMS at discrete time intervals over each site. Such an interaction between these two areas could be taken as evidence for compensatory mechanisms in the brain following damage.
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POSTER 63

Coarse to fine processing in natural scene categorisation

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A large number of experiments from our group have shown that humans are both very efficient and very fast at detecting objects in natural scenes. We made the assumption that the visual system relies on the first wave of feedforward information to compute a coarse object representation. But what are the limits of such representations? Are they sufficient for tasks that may require further detailed analysis? Here, we present the results of two experiments that support a coarse to fine processing hypothesis. (1) The dynamic course of information extraction was analysed using a Rapid Serial Visual Presentation paradigm in which a sequence of 20 natural scenes was shown at different rates. Famous faces were used among varied distractors for different tasks such as detection, gender discrimination, and identification. Gender discrimination processing was shown to be as accurate and to require as little processing time as simple detection, whereas identification required much longer inter-stimulus intervals. (2) The second experiment compared categorisation at the superordinate level (animal/non-animal) and at the basic level (dog/non-dog) in a go/nogo categorisation task. A dog was categorised as an animal much faster than as a dog. Reaction times were 50 ms longer in average for dog categorisation. This additional processing time was seen even on for the earliest responses. According to the diagnostic recognition framework proposed by Schyns (Schyns, 1998), cue availability is reduced in experiment 1 because of masking disruption (suppression of visual features) while task constraints are increased in experiment 2 (towards more detailed diagnostic features); both lead to performance impairments for accuracy or processing speed. These results support the idea of a coarse to fine visual processing. The fast wave of coarse processing could be used to control further processing of incoming detailed information.

POSTER 64

Interferon-α inhibits synaptic plasticity *in vivo*

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Interferons (IFNs) are natural proteins produced by the cells of the immune system in response to challenges by foreign agents such as viruses and tumour cells They have been evaluated for effectiveness in managing many diseases that involve the immune system, and type I interferons (Interferon-alpha) are now FDA-approved to treat hairy cell leukaemia, AIDS-related Kaposi's sarcoma, chronic myelogenous leukaemia and Hepatitis C, for example. While IFN-alpha has enjoyed some success as an antiviral agent, serious side-effects can compromise treatment efficacy. Patients report cognitive side-effects ranging from mild concentration impairment to memory loss, depression and paranoid psychoses. We examined the effects of systemic, chronic recombinant IFN-alpha 2a (Roferon-A) treatment (representative of a mid to high clinical dose) on hippocampal synaptic transmission and synaptic plasticity in vivo. This treatment regime produced severe impairments in the excitability (input-output function) and short-term plasticity responses of dentate gyrus granule cells. Furthermore, IFN-alpha prevented the induction of long-term potentiation (LTP) in the medial perforant path of the dentate gyrus *in vivo* following high-frequency stimulation. These results show that IFN-alpha, at doses within the clinical range, impairs hippocampal function *in vivo* and provide insight into the mechanism(s) behind the presentation of IFN-induced-side-effects such as memory impairments.

POSTER 65

The retina of crayfish *Procambarus* clarkii shows crustacean hyperglycemic hormone circadian variations

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We reported elsewhere * crustacean hyperglycemic hormone (CHH) secretion by retinal cells of crayfish *P.clarkii*. Hence the aim of this work was to investigate whether this species retina CHH abundance oscillates along the daily cycles. Two batches of adult *P.clarkii* were subjected to two light protocols 1) 18 animals maintained under LD cycles for two weeks 2) 18 animals under similar condition and then exposed to darkness (DD) for three days. The day of the experiment ,at six time points of a 24 h cycle , three animals of each group were anesthetized and killed .The retinas were dissected and processed for Western-blotting by using a primary antiserum of lobster (donated by Professor. PG.Giulianini, U.Trieste). The gels and blots were scanned and digitalized and the average intensity of the bands quantified. The data obtained were plotted in chronograms and analyzed by COSINOR. The results revealed CHH abundance statistically significant circadian rhythm under DD that is masked under LD. Interestingly this rhythm shows the zenith between 1600 and 2000 h, preceding the maximal peak of the hemolymph glucose circadian rhythm, at 24 h. These results suggest retina as a potential locus of production of CHH contributing to the circadian regulation of glycemia in this crustacean.

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Poster 66

Sequential striatal lesions have additive effects on skilled forelimb movements: the role of ipsi- and contralateral motor control in a rat model of Parkinson's disease

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Unilateral dopamine depletion in rats induced by injection of 6-hydroxydopamine (6-OHDA) into the nigrostriatal system cause permanent impairments in limb use. The functional deficits after dopamine depletion, including impairments in skilled reaching, are most severe on the side contralateral to the lesion. A number of studies, however, have also described ipsilateral deficits in skilled reaching. The purpose of this study was to investigate the effects of sequential striatal 6-OHDA lesions on skilled reaching movements in rats. Rats were trained in a reaching task to grasp food pellets with their preferred paw prior to receiving a contralateral intrastriatal 6-OHDA injection. The lesion significantly reduced reaching success along with qualitative impairments in limb use. In addition, animals displayed asymmetry in limb use and rotational bias after an apomorphine challenge. Three weeks later, animals received a second lesion induced by intrastriatal 6-OHDA injection into the intact hemisphere. The second lesion exaggerated the previous impairments in limb use and further reduced reaching success of the preferred paw. The findings of additive effects of sequential lesions use suggest that both the ipsi- and contralateral striatum control single limb use. This supports the notion of bilateral control of skilled forelimb use that involves the dopaminergic system.

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POSTER 67

The development of reaching movements during childhood.

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The present study was undertaken to follow the development of the capability to produce fast and precise reaching movements. One child was tested repeatedly from age 6 to age 9. The subject was requested to move a hand-held cursor on a digitizing tablet from a common start point to one of six targets at 3 distances, in 2 directions, presented in pseudo-random sequences. Targets and a screen cursor were displayed on a computer monitor. Vision of the hand and arm was blocked. Subject was to make "single, quick, uncorrected movements" to the targets, as soon as possible after the target appearence.

Accuracy increased progressively, while reaction and movement times decreased, eventually approaching those typical of the adult. Most important, our subject changed the strategy adopted for reaching to targets at different distances: when youngest, he scaled movement times of trajectories mainly ("width control"); when older, he scaled peak velocity of a stereotyped bell-shaped trajectory ("height control"), thus adopting an adult-like strategy. This finding suggests that, from age 6 to 9, children become capable of making quick and accurate trajectories to target, by implementing the strategy typical of adults.

POSTER 68

NMDA receptor activity is required to consolidate and decay spatial procedural memory traces

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NMDA receptors are heavily involved in many forms of neural plasticity. In particular, they are needed in LTP and LTD induction. Aim of this study was to assess the NMDA receptor role in consolidation and decay of spatial procedural memory traces. In the first phase, all animals were trained in the Morris Water Maze to abandon peripheral swimming and to reach an extended foraging around the pool. After training, rats were divided in four different

groups in which i.p. injections of a competitive NMDA receptor antagonist (CGS 19755) were administered according to different post-training times. Control animals matched for age and weight with CGS animals were injected with saline. In the first two groups, the CGS was administered immediately after training. In the first group the rats were tested twice after 1 and 24 hours. In the second group the animals were tested 48 after 48 hours. All animal belonging to this two groups were unable to put into action the previously acquired foraging strategy, probably not yet consolidated. In a third group, the CGS administration occurred 1 hours after training. The drugged rats, tested 6 hours later, were able to put into action the previously learned effective explorative strategy, suggesting the occurred consolidation of the spatial procedural memory trace. In the fourth group, drug injections were administered 24 hours after the training and the rats were tested 24 hours later (and thus 48 hours after the training). Surprisingly, the drugged animals showed better performances than controls, maintaining the previously acquired procedural competence. This result was probably linked to the role played by NMDA receptors on memory trace decay. In full agreement with electrophysiological data, such results allowed hypothesizing that NMDA receptors are involved not only to induce learning processes but also to switch them off.

POSTER 69

Long-term behavioural and neurochemical consequences of prenatal immune activation: Towards an immunoprecipitated neurodevelopmental animal model of schizophrenia schizophrenia

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Epidemiological studies have indicated an association between maternal bacterial and viral infections during pregnancy and the higher incidence of schizophrenia in the resultant offspring post-puberty. One hypothesis asserts that the reported epidemiological link is mediated by prenatal activation of the foetal immune system in response to the elevation of maternal cytokine level due to infection. Here, we report that pregnant mouse dams receiving a single exposure to the cytokine-releasing agent, polyriboinosinic-polyribocytidilic acid (PolyI:C; at 2.5, 5, or 10 mg/kg) on gestation day 9 produced offspring that subsequently exhibited multiple schizophrenia-related behavioural and neurochemical deficits in adulthood, in comparison to offspring from vehicle injected or non-injected control dams. The spectrum of abnormalities included impairments in explorative behaviour, attention, response switching, working memory and sensitivity to systemic amphetamine. Long-term neurochemical consequences of the prenatal PolyI:C treatment were further confirmed by the observed up-regulation of GABA(A) receptors containing the alpha2 subunit in the ventral dentate gyrus and reduction in adult neurogenesis in the dorsal dentate gyrus, that correlated significantly with behavioural abnormalities. Visualization of astrocytes and apoptotic cells revealed no differences between adult offspring of PolyI:C-treated and control mothers, suggesting that the reported neurochemical changes in the PolyI:C-offspring occurred in the absence of neurodegeneration and reactive gliosis. We conclude that prenatal PolyI:C treatment in mice can robustly capture a comprehensive array of attentional, cognitive, neurochemical and neuropathological abnormalities associated with human psychosis. It thus represents one of the most powerful environmental-developmental models of schizophrenia to date, enjoying a high level of face and construct validity. The uniqueness of this model lies in its epidemiological and immunological relevance, and it is, sui generis, ideally suited for the investigation of the neuropsychoimmunological mechanisms implicated in the developmental aetiology and disease processes of schizophrenia.

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POSTER 70

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Converging data suggest that entorhinal cortex (EC) is involved in pavlovian olfactory learning. More precisely, we have previously shown that animals lesioned in the EC displayed conditioned aversion to a discrete odor stimulus (conditioned stimulus, CS) paired with a toxicosis (unconditioned stimulus, US) when the interstimulus interval (ISI) between the olfactory CS and the US is too long to support conditioning in sham-lesioned rats.

According to models of conditioning assuming that the CS and the context compete for association with the US, the facilitation of conditioned odor aversion (COA), that is the successful competition of the olfactory CS over the context to be associated with the US, may be the consequence of an alleviation of the direct context-US association. In order to test this hypothesis, the effects of EC lesions were evaluated using two aversive conditioning tasks resulting on preferential association of either an olfactory CS (COA) or the training context (conditioned context aversion, CCA) with the US. Male Long-Evans rats bilaterally lesioned in the EC received odor- or context-US pairings with a short (5 min) or long (120 min) ISI. Results showed that sham-lesioned animals displayed COA with the short but not with the long ISI confirming that the memory trace of the odor is subject of rapid decay. When tested in the CCA, sham-lesioned rats showed a clear aversion to the context when the US occurred 5 min after animals were put in the training context but not if the US was administered 120 min after. In contrast, EC-lesioned animals displayed COA with both ISI, thus confirming previous data, but did not display any aversion to the context whatever the ISI. The deficit of CCA and the facilitation of COA observed in EC-lesioned animals suggest that the EC is involved in setting the imbalance between conditioned aversion to discrete and contextual stimuli.

POSTER 71

Chaos and modulation of oscillatory activity during 1 Hz repetitive TMS of the motor cortex: a combined EEG and TMS study.

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Repetitive transcranial magnetic stimulation (rTMS) is a powerful tool for researching brain function and for modulation of cognitive performance. In this study a combined transcranial magnetic stimulation/electroencephalography (TMS/EEG) method was used to investigate the activation and interaction of cortical regions during delivery of low frequency 1 Hz repetitive magnetic pulses over the left primary motor cortex (M1) in 10 healthy subjects. Four trains of 400 pulses of 1 Hz magnetic or peripheral electric stimulation were performed: rTMS at 80% RMT, rTMS at 100% RMT, sham rTMS, and repetitive electrical stimulation. We evaluated the EEG reactions to each condition using event-related power (ERPow) and event-related coherence (ERCoh) transformations of α and β rhythms. TMS at 100% RMT induced oscillations with an increase of ERPow in the first 500 ms after stimulation and a subsequent rebound with a decrease in amplitude in EEG oscillations in the second epoch of 500 ms during stimulation. This trend was accentuated in premotor and central electrodes ipsilateral to the stimulation side for both frequency ranges analyzed. The ERCoh revealed that, over all experimental conditions, TMS produced a significant decrease of coupling between electrodes during the trains of stimulation with a subsequent increased density of functional links obtained after each train. A significant decrease in ERCoh was more prominent between motor and frontal areas during 1 Hz TMS stimulation and was similar for both frequency ranges analyzed. These findings suggest that oscillatory cortical activity of the human motor system might be modulated by low frequency repetitive electromagnetic pulses applied to M1, suggesting a phenomenon of massive activation and decoupling between areas.

POSTER 72

Amnesia induced by antibodies to the neural cell adhesion molecule (NCAM) is only effective for non-spatial forms of learning in the rat

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Antibodies directed to the neural cell adhesion molecule (NCAM) induce amnesia of animal learning paradigms if delivered to the ventricles at the 6-8h post-training time. This phenomenon has now been observed in three separate laboratories for discriminative avoidance tasks in chicks and both passive avoidance and appetitive learning in rats. To establish if spatial learning could be similarly affected, we determined the consequence of administering anti-NCAM to postnatal day 80 Wistar rats at 6h following a single 5-trial session in the Morris water maze. Following training, aliquots (5µl) of anti-NCAM (generous gift of Elisabeth Bock) were delivered by cannula to the ventricles of unrestrained animals.
Surprisingly, latencies to reach the hidden platform were unaffected in subsequent water maze trials at 24h and 48h following administration of anti-NCAM. As controls, the antibody was found to effectively induce amnesia of an avoidance task and to recognise all NCAM isoforms by an immunoblotting procedure. These results confirm subtle differences to underpin spatial and non-spatial forms of learning.
Supported by Enterprise Ireland and the EU 5th Framework. CMR and KJM are Science Foundation Ireland Investigators.

POSTER 73

Quality Fiber Tracking related DTI with 1.5T tomograph.

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Diffusion Tensor Imaging provides white matter bundles reconstruction starting from the acquisition of multiple T2-weighted images with gradients perturbation along pre-defined directions (direction encoding). The spatial resolution is given by the plane matrix resolution and the slice height; the angular resolution is given by the number of direction encodings. The time required for a DTI acquisitin takes into account both these parameters of resolution. For a six-directions encoding, the time needed is seven times the simple T2 acquisition (six directions plus the isotropic T2). Poor spatial images lead to evident errors in fibres reconstructions if compared with anatomical atlas. Because fast images are acquired by selecting the next slice only after all directions have been encoded on the previous one, subjects movements are often found in the resulting images and can lead to truncation or misty anatomy in fibres reconstructions; thus, movements need to be reduced to the minimum for post-processing images comparison. Sequences need to be both fast and giving good resolution in space and angle. A 3T RM tomograph ensure fast acquisitions, but most RM tomographs used in hospitals for brain scans at the present time are 1.5T. This study provides a number of acquisitions taken with a 1.5T Philips Gyroscan Intera with system version 9 and specific DTI patch. Comparison is made on the results quality of DTI acquisition taken at different spatial and angular resolutions, computed with widely used specific software. The resulting images are catalogued for signal-to-noise ratio, acquisition time, spatial resolution, angular resolution, number of fibres found in specific ROIs, length of fibres, movement artefacts and proper anatomical comparison with brain atlas. This work identifies sets of parameters of acquisition that provide good quality Diffusion Tensor images that can be taken into account also in clinical measurements needing short time acquisitions using a non-expensive 1.5T tomograph.

POSTER 74

Emotional content and declarative memory : an event related potential study

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Several studies suggest that emotional arousal can promote memory storage. In this study we evaluated the effects of emotional content on declarative memory, utilizing an adaptation of two versions of the same story, with different arousing properties (neutral or emotional), which have been already employed in experiments involving the enhancing effects of emotions on memory retention. We used event related potentials (ERP) to evaluate whether there is a sex-related hemispheric lateralization of electrical potentials elicited by the emotional content of a story. We compared left and right hemisphere P300 waves, recorded in P3 and P4 electrode sites, in response to emotional or neutral stimuli in men and women. In the left hemisphere, emotional stimuli elicited a stronger P300 in women, compared to men, as indexed by both amplitude and latency measures; moreover, the emotional content of the story elicited a stronger P300 in the right hemisphere in men than in women. The better memory for the arousal material may be related to the differential P300 at encoding. These data indicate that both sex and cerebral hemisphere constitute important, interacting influences on neural correlates of emotion, and of emotionally influenced memory.

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POSTER 75

Intracranial self-stimulation ameliorates the memory decifit in rats bearing lesions of the basolateral nucleus of the amygdala

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We have previously reported that post-training intracranial self-stimulation was able to reverse the amnesic effects of parafascicular lesions on two-way active avoidance, in rats. Since the basolateral nucleus of the amygdala has been implicated in the modulatory effects of emotional arousal on learning and memory, we have now tested the possibility that intracranial self-stimulation could also reverse the detrimental effects caused by lesions of the basolateral nucleus on the same task. Besides to confirm that basolateral lesions impair conditioning and that intracranial self-stimulation improve it, our results showed that intracranial self-stimulation ameliorates the detrimental effects of basolateral lesions on two-way active avoidance. We, therefore, suggest that intracranial self-stimulation could be an effective way to improve learning and memory in rats with brain damage.

POSTER 76

Limbic thalamus and odour-place association learning

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A common view of diencephalic amnesia is that a single diencephalic structure is responsible for the memory impairment, but an alternative view is that different diencephalic structures contribute to the memory impairment in subtly different ways. This study directly compared the effects of highly selective lesions to anterior, medial and lateral aggregates of the limbic thalamus in PVGc female rats (AT, MT and LT, respectively) on an odour-place paired-associate task in an open field. AT and LT, but not MT lesions, severely impaired performance on this task. Spatial probe trials introduced at the end of training suggested that rats may use a combination of allocentric and egocentric strategies to solve the task. The impairment in odour-place paired-associate learning in the AT group is consistent with previous research using object-place conditional learning (Sziklas & Petrides, 1999) and supports the proposal that the AT is part of an 'extended hippocampal system' (Aggleton & Brown, 1999). The impairment in the LT group provides new evidence on the potential role of the LT in paired associate learning. Spatial probe tasks highlight the need for future studies to control for the use of egocentric response strategies. These results show that multiple regions of the limbic thalamus may influence learning and memory tasks. Models of memory function (for example, Kesner, 1998; White & McDonald, 2002) should pay greater attention to the important and potentially diverse role of the thalamic nuclei in memory.

POSTER 77

Controlled impact device for simulating TBI with an animal model

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An experimental device has been developed to simulate the occurrence of TBI (traumatic brain injury) via linear impacts to exposed rodent dura mater in situ. The impact device is classified as a direct brain rigid body impact device1. The device has the versatility to provide complete freedom to vary the line of action of the impact while ensuring that the line of action passes through the centre of mass of the head, thereby avoiding the effects of any rotational acceleration. Impact conditions were calculated analytically and validated experimentally. The device is used in conjunction with

intracerebral microdialysis techniques to quantify various neurochemical responses of the brain during and for up to six hours following trauma2. While this device can be used to model different traumatic lesions, it is likely that it will be of greatest use in simulating concussion, contusion and axonal injury.
[1]: Gilchrist, M.D., Strain, 40, 180-192, 2004.
[2]: O'Connor, W.T. et al., Proc. IUTAM Symp., Impact Biomechanics, Dublin, 2005.

POSTER 78
Exercise, but not environmental enrichment, improves learning after kainic acid-induced hippocampal neurodegeneration in association with an increase in brain-derived neurotrophic factor
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Previous studies have suggested that exercise in a running wheel can be neuroprotective, perhaps due to, among others, gene-expression changes after exercise, increases in trophic proteins and/or enhanced cardiovascular responsivity. Here we ask whether physical exercise or environmental enrichment provide protection after brain damage, especially in terms of recovery of cognitive function. To evaluate the neuroprotective effect of these conditions, we used the kainic acid (KA) model of neuronal injury. Systemically-administered KA induces excitotoxicity by overstimulation of glutamate receptors, resulting in neuronal death by necrosis and apoptosis. Our results show that exercise, but not enriched environment, prior to KA-induced brain damage, improved behavioural performance in both Morris watermaze and object exploration tasks. However, prior exercise did not decrease to control levels the hyperactivity normally seen in KA-treated animals, as measured by ambulation in the open field. Furthermore, both exercise and enriched environment did not protect against neuron loss in CA1, CA2 and CA3 areas of the hippocampus, despite a substantial increase in BDNF levels in dentate gyrus of the exercise and KA-treated animals.

POSTER 79
Large-field interaction: a comparison between non-human and human primates
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Regarding Cebus monkeys color vision, molecular genetic and eletroretinography studies have provided evidences that these animals present a polymorphism characterized by dichromatism and trichromatism, males expressing only dichromatic phenotypes. The trichromatic colour vision has been considered an important ability, allowing animals to discriminate edible fruits and leaves. Therefore, suggestions about possible advantages of dichromatism have been formulated. A dichromatic vision may be outweighed by other parameters of stimuli such as size. In this respect, large-field trichromacy is a general feature of protanope and deuteranope humans, provided the stimuli size extends to 8 degrees visual angle. In order to verify if performance of tufted capuchin monkeys (Cebus apella) is affected by stimuli size, we tested the performance of five males and three females subjects and compared with 12 dichromatic humans in discriminating pairs of Munsell colour papers that differed in size. Tests were conducted with two types of papers: chip size (1,2cm diameter) and chart size (12,5cm x 7,5cm). Results with the chips showed that just one female discriminated orange versus green pairs, while the other two females and all males showed a fortuity response in these situations. Concerning larger stimuli, all animals showed the same performance presented before, in contrast with humans that had a significant improvement in their performance in this condition. Thus, capuchin's behaviour did not seem to be affected by stimuli size and, at least, for the conditions used here, Cebus apella do not seem to present large-field trichromacy different of those human primates tested.
Keywords: Large-field interaction; Capuchin monkey.
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POSTER 80
Non-invasive imaging of neural oscillations underlying cognitive and sensory processing.
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In order to understand the functional role of neural oscillations in healthy humans, a brain imaging technique capable of estimating the intracerebral sources of these activities is essential. Here we describe a new technique transforming the electrical signals recorded at the scalp (EEG) into intracranial estimates of the oscillatory activity of neuronal populations. In contrast to standard neuroimaging techniques this approach allows attributing oscillatory activity to cerebral structures generating it, leading to 3D-functional images of brain structures involved in the generation of the oscillatory activity (OA) during different motor and cognitive tasks.
For the experimental validation we departed from the following hypothesis. If OA can be consistently attributed to its neural origin by this technique, then, knowledge about the OA arising at particular brain areas collected during some trials should be sufficient to determine the behavioral or the cognitive state in which a subject is engaged in future trials with an accuracy largely superior to chance. This means in popular words reading the mind from the electrical signals it produces.
We illustrate this technique with two different datasets. The first dataset was obtained from subjects engaged in a simple visuomotor reaction time task. Our aim was to discriminate which hand (left or right) was engaged in a simple manual response task. The second EEG dataset was collected while subjects performed an explicit recognition task using different categories of stimuli (words, non-words, images and non-images) presented visually. Accuracy of the decoding was high (>85%) for all subjects and experimental categories confirming that our method allows a non-invasive imaging of oscillatory brain responses to different tasks with a high rate of accuracy. Such images could therefore contribute to bridge the existing gap between human cognitive neuroscience and animal electrophysiology.

POSTER 81

Transplantation of human umbilical cord blood-derived neural progenitors (HUCB-NPs) improves functional recovery after ouabain lesion in the rat striatum

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Degeneration of brain tissue following stroke leads to functional impairment with limited brain self-repair. Transplantation of stem cells has been proposed as future therapies for neuronal replacement. The aim of study was to examine the effectiveness of HUCB-NPs on functional recovery in rats after focal brain injury. Materials and methods. Unilateral ouabain lesion (the model of stroke) was induced in the striatum of adult Wistar rats. Then HUCB-NPs were injected into ipsilateral internal carotid artery, two days after the injury. Functional deficits were measured for a month after transplantation in various behavioral tests: beam walking, rotarod skilled walking, delayed spontaneous alternation, apomorphine-induced rotations. Locomotor activity and exploratory behavior were tested in the open field. Results. In between lesion and transplantation all rats showed marked deficits in walking beam task. The most sensitive measurement of functional recovery was apomorhine-induced rotations. The number of rotations induced by apomorphine (0.75mg/kg s.c.) was significantly reduced in rats after HUCB-NPs treatment. This was correlated with histological analyses. The cavity at the epicenter of the injury site was smaller in experimental animals than control counterparts. In conclusion, HUCB-NPs transplantation improves functional outcome and promotes structural repair in rats after focal brain injury.
Supported by grant K057/P05/2003

POSTER 82

Videotracking system using simple detection method can measure locomotor activity in rats

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We developed simple computer-based videotracking system for analysis of rat locomotor activity. Detection method requires high contrast. Program track objects in which sample square with user-defined size can be fitted. This allows to capture position of center of rat trunk without influence of tail and head movements. It let to obtain quite smooth data. This method has also disadvantage – when rat is turning and his body is curved, recorded point is not a rat trunk center. It lies close to inside edge of rat's shape. However this method provides good approximation of path traveled by the rat. After smoothing with SEE workshop (Drai i Golani, 2001) total distance traveled can be successfully used to measure changes in locomotor activity.
Drai D. i Golani I. „SEE: a tool for the visualization and analysis of rodent exploratory behavior" Neurosci Biobehav Rev 25 (2001) 409-426

POSTER 83

Chronic nicotine administration restores genetic-induced cognitive defects via recovery of endogenous cholinergic activity

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We previously showed that ß2-containing nicotinic receptors are necessary for executive functions, using mice knockout for the gene coding for ß2 subunit of the nicotinic receptor (ß2-/- mice). These results led to the hypothesis that ß2-containing nicotinic receptors are involved in hierarchization of motivations in decision-making tasks (Granon et al. 2003). Chronic administration of nicotine is known to lead to neural modifications associated to long term alteration of cognitive functions. Here, we investigated the role of the ß2 subunit on such effects.
ß2-/- mice were chronically exposed to nicotine and subjected to behavioural paradigms targeting spontaneous organization of paths, learning, circadian activity, social interactions and anxiety. Our results indicate that chronic nicotine induces various effects in ß2-/- mice compared to WT mice which might result from selective activation of different brain circuits. In ß2-/- mice, nicotine restores behavioural flexibility but increases impairments in circadian activity and has no effect on learning, anxiety level and social interactions. To analyse if behavioural effects in ß2-/- mice result from an altered cholinergic activity, binding of hemicholinium, a marker of presynaptic choline transporter was measured. Preliminary results indicate that the binding is reduced in the striatum and the cingulated cortex of ß2-/- mice. Number of binding sites is restored after chronic nicotine exposure in the nucleus accumbens. These data suggest that behavioural compensation induced by chronic nicotine exposure originate from a modification in the activity of striatal cholinergic interneurons.
Acknowledgments: This research is supported by the Institut Pasteur and the CNRS. MB is supported by a PhD grant from the Letten F. Saugstad Foundation. SS is supported by a post-doc grant from the Association pour la Recherche sur les Nicotianés.

POSTER 84

U-shaped sensitivity to variability in face recognition

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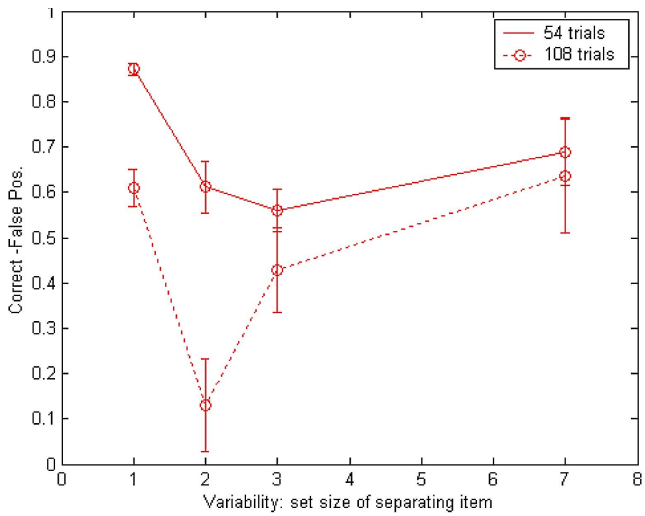
We have tested whether a U-shaped sensitivity to irrelevant variability is a general property of many learning mechanisms, rather than a language specific effect. Our experiment in face perception is analogous to a series of artificial language learning experiments by Onnis et. al (2003). They report a U-shaped variability effect for learning correlations between two non-adjacent items, when the separating item is drawn from a set of varying size.
In the version of our face recognition experiment most closely reproducing the design of the language experiment, faces were

composed from sets of (hair + ears) and (jaw + mouth) as correlated non-adjacent pairs, and differently sized sets of (nose + eyes) as the variable separating item. Subjects had to decide whether test stimuli belonged to the set of training faces after 54 and 108 face presentations. They showed a U-shaped sensitivity to the variability of the separating item.
A subsequent forced classification test suggests that subjects make use of the compositional structure of the stimuli only in the high variability condition. This may indicate a contrast between eiditic learning for low variability and rule-like learning for high variability with the middle cases being badly served by both.



POSTER 85

Taurine Administration During Lactation Modifies Hippocampal Ca1 Neurotransmission And Behavioural Programming In Adult Male Mic

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Taurine plays a role in neuronal development. In this study, we examined whether postnatal taurine administration influences the long-term consequences induced by mild neonatal stressors (10 min maternal deprivation plus sham injection, applied daily to neonatal mice up to 21 days). At 30 days of age stressed mice showed higher pain threshold both in the tail-flick—which measures mostly the spinal mechanisms of pain—and in the hot-plate test—which reflects mainly the supraspinal mechanisms of pain. The latter effect was prevented completely by neonatal taurine administration, while the tail-flick test was not affected, thus suggesting that spinal pain is not sensitive to taurine treatment. At 140 days of age, mice which were stressed during the neonatal period showed consistent decrease in immobility time in forced swimming test, and taurine did not influence this parameter. At the same age, the fear/anxiety axis, measured with elevated plus maze test, did not show any consistent changes. Electrophysiological experiments in brain slices obtained from adult mice showed that input–output curves in hippocampal CA1 were increased by taurine administration in lactation. Hence, neonatal administration of taurine might permanently modify the functioning of hippocampus, a brain area which is known to be crucial for learning and memory.

POSTER 86

The effect of left-handedness on lateralization of motor functions in the brain – fMRI study

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Despite long history of research on left-handedness our knowledge about the nature of this phenomenon is still incomplete. Previous neuroimaging studies have shown that brain activity during movements of the dominant hand in left-handers (LH) is more bilateral and involves wider areas than in right-handers (RH).
The aim of the presented study was to assess whether differences in activity patterns between LH and RH depend on type of motor behavior (simple vs. complex movements).
Twelve right-handers (6 males and 6 females) and 17 left-handers (6 males and 11 females) participated in the experiments. Subjects performed two types of motor tasks during fMRI scanning: simple movements (flexion-extension movements of an index finger) and complex movements (sequential thumb-to-fingers opposition tapping in proper order). Those tasks were performed both with right and left hand in sequence.
The results show that during simple movements of either hand in either group activation was exclusively contralateral and focused in somatosensory and motor cortex. In addition activation in IPA was observed. Simple movements of the right hand resulted in activation of a wider area in the left hemisphere in RH than in LH, whereas simple movements of the left hand in activation of a wider area in the right hemisphere in LH than in RH. In contrast to simple movements, during complex movements a bilateral activation was observed in both groups. However, the groups differed as to the size of activated areas in ipsilateral vs. contralateral sides. Complex movements of the right hand resulted in larger area of activation in contralateral S1 and M1 in RH and larger area of activation in ipsilateral S1 and M1 in LH. In case of complex movements of the left hand both ipsilateral and contralateral activations covered larger areas in RH than in LH.
The obtained results suggest that functional brain lateralization of motor function depends on handedness and complexity of a task.

POSTER 87

Behavioural changes in rats exposed to perinatal MDMA

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Consequences of perinatal exposure to MDMA (methylenedioxymeth-amphetamine) was measured in rats. Pregnant female rats were treated daily with (+) MDMA (3 mg/kg) until the 21th postpartum day. Spontaneous locomotor activity and behaviour in elevated plus maze was checked 48 hours, learning performance was measured two weeks after separation. The locomotor activity enhancing effect of (+) MDMA challenge was also checked.
Results: 1. Perinatal exposure to (+) MDMA significantly enhanced the locomotor activity in males. No change in the elevated plus maze behaviour was observed. Number of intertrial crosses was higher in the drug-exposed rats. 2. (+) MDMA in a dose of 1mg/kg induced significant hyperlocomotion in male controls but failed to do this in male offspring exposed to perinatal (+) MDMA treatment. The results indicate that in animals exposed to perinatal (+) MDMA lost their ability to adapt to novel sorroundings and their sensitivity toward a subsequent (+) MDMA challenge decreases.
This study was supported by Hungarian grants OTKA TO-32736 and ETT-24/2003

POSTER 88

Acquisition of spatial relations between the distal cues and the platform's location occurs during locomotion in the morris watermaze

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The popular spatial learning task, the Morris Watermaze (MWM) requires rodents locate a hidden escape platform, in a pool of water, surrounded by distal visual cues. Studies suggest that a slow build-up of these relations between the distal cues and the platform's location is essential both for successful navigation and spatial memory. The present research focused on when these relations are established during the MWM task, as findings to date in this area have been inconclusive. In study one, it was demonstrated, with the MWM task, that by turning the lights off, as animals sit on the platform did not impair acquisition. No differences in performance were found between this group and that of control trials, where lights were on throughout the task. This suggests acquisition of this knowledge does not occur whilst on the hidden platform. This finding was confirmed by head direction analysis of movements made while on the hidden escape platform after each trial. Consequently it was verified that by training animals with the lights off during locomotion in the MWM, significantly impaired acquisition of the task. No significant difference in the escape latencies was found between the first and final days of acquisition in this group. Animals continued to spend the highest percentage of time in the outer edge (panic corridor) of the MWM on the final day of acquisition training. Results suggest that a build-up of the spatial relations in the environment occurs during locomotion in the MWM and is essential for successful spatial navigation.
The Irish Research Council for Science, Engineering, and Technology, Ireland, funded this research

POSTER 89

Spatial learning in the rat is NMDA-receptor dependent: evidence from an object displacement task

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The hippocampus has long been known to play a role in spatial learning and the cellular mechanisms underpinning this form of plasticity have been extensively investiagted. Research has revealed a key role for the N-Methyl-D-aspartate (NMDA) subtype of glutamate receptor in several forms of learning. Here we have investigated the effects of administration of the NMDA receptor antagonist (±)-3-(2-carboxypiperazin–4-yl)propyl–1-phosphonic acid (CPP) on the performance of rats in an object displacement task and have also investigated the possible role of extracellular signal-regulated kinase (ERK), a subtype of mitogen-activated protein kinase, in this form of learning.
Male Wistar rats explored 4 objects on day one of the task. After a 24 hour time delay, rats were exposed to the same 4 objects, one having been moved to a different area of the open field. The time spent exploring the moved object was measured and expressed as a percentage of total exploration time. Rats were killed following testing and the dentate gyrii and hippocampii were stored for later analysis of ERK by Western immunoblotting. The data show that rats injected intraperitoneally with CPP (10mg/kg) before, but not after, exploration on day one displayed impairments in spatial learning when compared with saline-injected controls. The NMDAR may thus be involved in the acquisition, but not the consolidation, phase of memory. In addition, a significant positive correlation was observed between the time spent exploring the moved object and the expression of activated ERK in the dentate gyrus. No such correlation was apparent in the hippocampus. This study implicates the NMDARs in the acquisition phase of spatial learning and provides evidence for a role for ERK in spatial learning in the dentate gyrus of the rat.
The financial support of Trinity College Dublin is acknowledged

POSTER 90

Coping with uncertainty during response selection in a reaction time task.

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Choice reaction time (CRT) is shortened considerably when a precue specifies what stimulus will follow. In fact, consistent precuing turns a CRT into a simple RT (SRT) task if the cue - stimulus interval is kept within appropriate limits. The RT difference between CRT and cued CRT is then the time taken to process the stimulus

and select a response. Things become more complicated when some uncertainty is introduced by occasional incongruent cue-stimulus relationships. If most trials (75% in the present study) are congruent subjects are expected to still anticipate the upcoming stimulus, prepare a specific response and then either execute it with a shortened RT (relative to that in SRT) or switch to the alternative response in the event of incongruent cuing. Response switching requires extra time, which manifests in a longer RT in incongruent trials. Analysis of individual subject's performance revealed that 12/24 subjects indeed maintained this strategy while the other 12 subjects could not be shown to systematically anticipate the forth-coming stimulus when uncertainty was introduced. In both groups RT in congruent trials did not differ significantly from the RT in the simple RT task, regardless of the inter cue-stimulus interval that was used. The anticipating subjects scored higher than the unanticipating subjects on congruent trials, but surprisingly they did score higher on incongruent trials too.
In conclusion, what seems to be a default strategy in performance of CRT with moderately incongruent cuing was only adopted by half the subjects. The other half were still influenced by the cue but apparently resorted to guessing its true relationship to the pertinent stimulus. Finally, these strategies were not influenced by the cue to stimulus interval within a range of 200 to 1600 msec.

POSTER 91

Push and reach related neuronal activity in the posterior parietal cortex and the superior colliculus of the primate brain

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Extracellular single-cell recordings were performed simultaneously in the intermediate and deep layers of the superior colliculus (SC) and the posterior parietal cortex, most probably the parietal reach region (PRR) during a visuo-motor reach and push task in an awake, behaving, male macaque monkey. 139 PRR and 113 SC units displayed significant modulation of their firing rate in a visually guided reach task. Interestingly, 60 modulated SC and 61 PRR neurons were not active in the reach phases of the task but instead they were strongly active during pressing the reached button. We described here for the first time details of the response properties of these PRR and SC push neurons. The recorded push neurons were not responsive to passive arm movements or to somato-sensory stimulation and had very low or no spontaneous activity. The push responses appeared consistently after the beginning of the button press with latencies ranging from 40 to 150 ms. The activity of about two-thirds of the PRR and SC push units were selective to the target location. The target location that elicited the maximal push responses varied among the recorded cells. The discharge rate of PRR and SC push units was consistently not modulated by gaze direction. We recorded push activity in the left and in the right SC during button pressing with the right arm. The magnitude of the push responses of SC neurons were dependent on the push strength, stronger push elicited significant higher discharge rates than lighter push. The push activity of PRR and SC units may derive from poprioception and may serve to stabilize the arm to maintain constant push strength at a certain spatial position.
Supported by DFG SFB 509/B2 and Humboldt Foundation (A.N.)

POSTER 92

Path planning: prefrontal cortex as an efficient wayfinder navigator system.

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Prefrontal cortex is thought to be involved in a wide variety of high level cognitive functions such as working memory, attentional processes, planning of actions (Dalley et al. 2004) and spatial cognition (Hok et al. 2005). Here, we investigated the involvement of the prelimbic/infralimbic areas of the prefrontal cortex in path planning using a place avoidance task (Cimadevilla et al. 2001). In this task, the rats must avoid a sector in a rotating circular arena. The sector is either a room-defined region of the arena (i.e., stable relative to the laboratory frame despite arena rotation) or an arena-defined region rotating with the arena (i.e., stable relative to the arena frame). We first show that both sham and lesioned rats are able to learn a simple version of the task in which they have to avoid only one sector either in the arena frame or in the room frame. Next, we demonstrate that rats with prefrontal lesions are impaired in a more complex task in which they have to avoid the two sectors (room-defined and arena-defined) simultaneously. Nevertheless, this impairment seems to be transient as lesioned animals recover normal scores across time, suggesting the existence of another, slower planning system working in parallel.

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POSTER 93

Pre-conflict interaction & conflict cause related to reconciliation in language impaired preschool boys

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Resolving conflict with reconciliation, friendly contact between former opponents shortly after conflict termination, is positively linked with initiation/resumption of peer interaction, and in turn, training of language and social behaviour. The relation between pre-conflict period social interaction (reciprocal exchanges), conflict cause, affiliative behaviour acceptance rate and reconciliation is examined in 11 language impaired boys (LI) and 20 boys with typical language development (TL), 4-7 years old. The groups were video filmed separately during free-play at preschool. Conflicts are identified and coded according to a validated system. LI boys reconcile fewer conflicts than TL boys, which stems partly from aberrant caused conflicts (play/protests that escalate to screaming/physical ranting) that are reconciled at lower rates than non-aberrant caused conflicts. Nearly 15% of LI conflicts, but only 0.5% of TL conflicts, are aberrant caused irrespective of pre-conflict social

interaction between opponents. Opponents accept individually exhibited affiliative behaviour at similar rates in both groups, but LI boys exhibit affiliative behaviour in a smaller conflict share than TL boys. Further, LI boys exhibit reconciliatory behaviour comparatively less frequently and reconcile fewer conflicts than TL boys when social interaction is absent in the pre-conflict period. Within the LI group this represents a significant factor. Pre-conflict social interaction may serve as a reference point in the reconciliatory process for LI boys. In aberrant caused conflicts, difficulties regulating behaviour seem to hinder reconciliation. In addition to traditional psycholinguistic remediation, language impaired children may benefit from intervention methods that support initiating and maintaining communicational contact, as well as effectively concluding behavioural turns.

POSTER 94

Investigation of markers of autonoetic consciousness accompanying episodic autobiographical recall

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Autonoetic consciousness(AC), the hallmark of episodic memory(EM), infuses EM with emotion, thoughts, and subjectivity. Efforts to dissociate AC from noetic awareness have been criticised as lacking validity.
This study investigated phenomenological indices of EM in Childhood(0-15 yrs) and Early Adulthood(15-30 yrs) in 30 adults (18-60yrs,mean:25.63,sd:10.04). Participants recalled one autobiographical event (ABM) from 3 topics (school or professional life/family event/religious occasion). Memories were scored with a modified Event Details Checklist (Moscovitch et al, 1998). Descriptions of ABM visual representation were elicited.
ABMs were classified as Reliving, Partly Reliving, Everything But, and Not Reliving. AC markers were perspective, emotional connection, and reliving judgment. Reliving was associated with viewing memories through "own eyes" (c2=6.300,p=.043), rich detail (F(3,26)=4.194,p=.015) and strong emotional connection (c2=26.250, p=.000). There were clear gender differences, with more females reporting reliving (c2=6.652, p=.01), and stronger emotional connection to retrieved memories (c2=8.438, p=.004) than males.
A true episodic ABM is rich in detail, infused with AC as indexed by reliving judgments, appears to be viewed through one's own eyes, with continuity and movement, culminating in strong emotional connection and feeling that one has mentally "travelled back" to the original event.

POSTER 95

The effects of early nutrition on brain structure

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Animal studies have shown that early nutrition can affect both brain structure and behaviour. In humans, effects have been shown on cognitive behaviour but not on brain structure since the methods to detect subtle morphometric differences have not been available until recently. We used voxel-based morphometry (VBM), a method of analysing structural MRI scans, to compare two groups of adolescents who had been born preterm, at a time of rapid brain development. In the postnatal period, they were randomly assigned to either a control diet or a nutrient-enriched diet (mean duration= 4 weeks); follow-up studies revealed cognitive differences in childhood. VBM showed that the enriched diet group had significantly more grey matter (-26, -57, 42; $p<0.018$, corrected by familywise error procedure) and less white mattter (-26, -58, 42; $p<0.006$) in the parietal lobe (see Figure 1). This is the first demonstration of differences in brain structure in relation to early nutrition in humans and has major potential biological and social implications. Figure 1Statistical parametric maps in the sagittal (A), coronal (B) and trans-verse (C) planes obtained using a conjunction analysis that searches explicitly for bilateral abnormalities. These maps reveal a bilateral difference in parietal grey matter between the enriched-diet group and the control-diet group. The Z-scores are superimposed in colour on the mean anatomical image for planes through the most significant parietal lobe voxels. A threshold of $p<0.001$, uncorrected, was chosen for display.
Supported by: Medical Research Council (UK) and the Wellcome Trust

POSTER 96

Characterization of creatine kinase, brain type, as a new and valuable areal marker in mammalian neocortex

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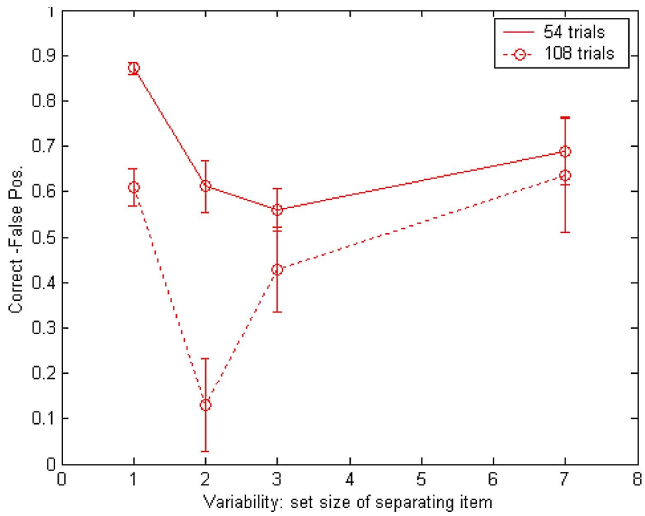
Various techniques were applied to study the neocortical parcellation into functionally specialized areas, but do not lead to a consensus. We compared the protein expression pattern of the primary visual (V1) and somatosensory area (S1) of mouse using 2-D DIGE and MS to screen for new potential areaspecific protein markers. During collection of V1 and S1, cytochrome oxidase stained sections were used as a guide to avoid regions of interareal borders. Sixteen proteins were found to be significantly differential between V1 and S1, of which 56% appeared more abundant in V1. We opted to study creatine kinase B (CKB), since this protein also appeared to be differential in comparable studies on cat neocortex. CKB plays a key role in the energy metabolism of tissues with fluctuating energy requirements. It was found to have a S1/V1 ratio 1,67 +/- 0,43. In situ hybridisation is a high-resolution method to screen total mouse brain for areaspecific expression differences at mRNA level, and confirmed the differential expression of CKB between V1 and S1 on mouse frontal and sagittal sections. We were able to distinguish with certainty different areas in the somatosensory, visual, auditory and motor system of the mouse identifying CKB as a valuable marker for the parcellation of mammalian neocortex



POSTER 97

Corticotectal neurons in the primate prefrontal cortex carry rule-related signals for pro-saccades and anti-saccades

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The learning and implementation of behavioural rules is a well established function of the prefrontal cortex (PFC). Animals and humans with prefrontal lesions have difficulty in tasks requiring the learning of, or switching between, behavioural rules. Neurophysiological studies have established that rule-selective activity is a robust property of PFC neurons. While these studies have been instrumental in determining the response properties of PFC neurons, no studies have specifically examined the responses of output neurons of the PFC. One target structure of PFC output neurons is the superior colliculus (SC). The PFC sends direct projections to the SC, however, the functional role of these projections remains unknown. Here, we identified PFC neurons projecting to the SC using antidromic identification, and recorded the activity of these neurons while monkeys performed a task in which they were required to perform alternating blocks of pro-saccades and anti-saccades. In this task, the animals were not explicitly cued as to which behaviour would be rewarded, rather the task contingency switched from one behaviour to the other after a given number of correct trials were performed. Thus, they were required to determine which behavioural rule was currently in effect. Many corticotectal PFC neurons exhibited rule-selective modulations in activity. Of these neurons, approximately half showed higher responses on pro-saccade trials, while the other half responded more strongly on anti-saccade trials. These data provide direct evidence that PFC neurons send rule-related activity to oculomotor structures.
Supported by the EJLB foundation and CIHR

POSTER 98

Posttraining isoflurane anaesthesia and memory consolidation of two-way active avoidance

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Some experimental procedures in learning and memory research need to anaesthetize the animal little after acquisition session. Volatile anaesthetics, such as isoflurane, are good candidates for this purpose, because of the rapid awakening of the animal. Nevertheless, few experiments have been done to evaluate its effect on memory consolidation. In the present experiment, we studied the effect of 15 min or 60 min posttraining isoflurane anaesthesia on 24 h or 20 days retention of a two-way active avoidance task. The results showed no effects of the isoflurane anaesthesia on retention independently of the duration of the anaesthesia and the retention delay. We conclude that isoflurane is a good election for those experiments that evaluate memory and require posttraining anaesthesia.
Contributed support: MCYT (BSO2003-04113), and MCYT FPI (BES/2004/4817).

POSTER 99

The development of an automated screening system for analysing the effects of 17-b-estradiol and other estrogenic compounds on stem cell fate.

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Recently, there has been concern over the presence of chemicals in the environment that are capable of modulating and disrupting the endocrine system. At present, there is no satisfactory in vitro, automated screen for these chemicals. To address this situation, we employed the P19 embryonal carcinoma cell line. P19 cells will form aggregates when they are seeded at 1 x 106 cells/ml in bacteriological petri-dishes. When the aggregated cells are treated with all trans retinoic acid (5 x 10-7 M) for four days, they can be induced to differentiate into a population of cells of neuronal phenotype. We confirmed the differentiation profile of these cells by immunohistochemical techniques with neuron specific markers, NeuN and NSE, a neural marker, nestin and an astrocyte marker, GFAP. Based on staining patterns, we selected the NeuN antibody as the best candidate with which to develop an automated screen. A specific macro was written with the KS300 (Zeiss) image analysis package that allows for image acquisition and subsequent manipulation of the captured data. The automated system measures the area of FITC and DAPI stain in a given field and generates a value reflecting the proportion of total nuclear area occupied by

the neuron-specific NeuN marker. We then counted the same field manually for total cell number (DAPI) and the total number of NeuN positive cells (FITC). It was found that this computed value is highly correlated with the proportion of cells that are neuronal as calculated by manual counts (Pearson r value = 0.8081). Preliminary studies have indicated, that treatment of P19 cells with 17-b-estradiol causes a modulation in cell fate determination, there is a significant increase in the percentage of neuronal cells in treated groups. The automated system can accurately detect this.
Funded by an Advanced Technologies Research Project grant from Enterprise Ireland.

POSTER 100

Activity and plasticity in the amygdala following controllable vs. uncontrollable stress.

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We studied the effects of controllable versus uncontrollable stress on neuronal activity and synaptic plasticity in the rat amygdala, in vivo. In the first experiment three groups of rats were used: the controllable stress group was trained in the Morris water maze to locate a hidden underwater platform, thus escaping the cold water; the uncontrollable stress group was exposed to the water for the averaged time of the controllable group, without the escape platform; naive rats were left undisturbed until the recording commenced. A second experiment examined the effects of another uncontrollable stressor - rats were placed on an elevated platform in the middle of a pool of water for 30 minutes. Immediately after the behavioral procedures rats were anesthetized and prepared for stimulating the entorhinal cortex and recording in the basal amygdala. Both uncontrollable stressors (water maze training and elevated platform) increased plasma levels of corticosterone and enhanced baseline activity in the amygdala, but decreased amygdalar LTP. The controllable stress group showed no difference from the naive rats in any of the measures. These results demonstrate that controllability modulates the effects of stress on amygdalar activity and plasticity, apparently via affecting the hormonal constituent of stress response.

POSTER 101

Exercise-induced changes in cognitive function: a role for IGF?

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Exercise has emerged as a possible means to maintain or improve brain health and plasticity throughout life. Data from animal studies suggest that growth factors may signal exercise-induced changes in cognitive function, particularly in the hippocampus. Accordingly, insulin-like growth factor 1 (IGF-1) and brain-derived neurotrophic factor (BDNF) may mediate exercise-induced cognitive enhancement and neuroprotection in the rat. Here, we have investigated the effects of both acute and chronic exercise on hippocampal function and circulating concentrations of IGF-1 and BDNF in human subjects.
Healthy, yet sedentary, male subjects (20-23yrs, n=14) were randomly assigned to a control and training group. Both groups underwent a 60min exercise bout, performed at 65% VO2 max, with blood samples taken at 30 min intervals before, during and after exercise. A face/name matching task was used to assess hippocampal function before and after the exercise bout. The training group then completed a five-week progressive training programme, while control subjects continued their sedentary routines. The 60min exercise task was repeated after the training period was complete. Plasma concentrations of IGF-1 and BDNF were analysed by ELISA.
A single 60min bout of exercise had no significant effect on hippocampal function or plasma concentrations of IGF-1 or BDNF. VO2 max data revealed that five weeks of training increased aerobic fitness levels and that this was correlated with an increased plasma concentration of IGF-1, but not BDNF, when compared with sedentary controls. Furthermore, training resulted in enhanced performance in the face/name task, as measured by speed of maximal acquisition of the task. The results of this study therefore demonstrate a positive correlation between physical fitness and cognitive function, which is concomitant with increased circulating IGF-1.
Supported by the Department of Physiology, Trinity College Dublin

POSTER 102

Basal but not KCL-stimulated medial prefrontal aspartate release is reduced by clozapine: a microdialysis study in two rat models of schizophrenia

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In the present study we employed microdialysis in the medial prefrontal cortex (mPFC) to investigate both basal and KCl-stimulated aspartate release in the isolated rearing and maternal deprivation rat models of schizophrenia and its response to chronic clozapine administration. In the isolated group young adult rats were weaned on postnatal day 25 (P25) and housed individually in environmentally scant conditions while the maternally deprived group experienced a single 24-hour period of maternal deprivation on P9. A socially reared group acted as controls.
Basal dialysate aspartate levels (mM) were similar in vehicle treated social controls, isolated and maternally deprived rats 0.109±0.045, 0.154±0.052 and 0.090±0.018 respectively (n=6-7)). Intra-mPFC KCl (100mM, 20mins) rapidly increased local aspartate release by +145%, +45% and +98% to 0.267±0.078, 0.224±0.064, and 0.178±0.035 in the control, isolated and maternally deprived rats respectively. Chronic clozapine (5mg/kg i.p. daily for 10 days) had no effect on basal asparate levels in the control or maternally deprived rats but reduced basal aspartate levels by 62% to 0.058 ±0.026 (p=0.032 v's isolated+vehicle) in the iso-

lated rats. Clozapine failed to effect KCl-stimulated aspartate release in any of the groups.
The findings show that while neither social isolation nor maternal deprivation are associated with a change in basal or KCl-stimulated aspartate release in the mPFC, the ability of clozapine to selectively reduce basal aspartate levels in the isolated rat suggests that prefrontal aspartate transmission is sensitive to atypical antipsychotics in this animal model of schizophrenia.
Supported by SFI Award to W.T. O'C, NDP, HEA, PRTLI and Wyeth.

POSTER 103
Effect of ascorbic acid on apomorphine-induced licking behavior in rat
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The effect of ascorbic acid (A.A.) was investigated on apomorphine-induced licking behavior in rat. Subcutaneous (S.C.) injection of various doses of apomorphine (0.125-1.25 mg/kg) induced licking. The licking response was counted by direct observation and recorded for a 75-min period. S.C. injection of A.A. (200-350 mg/kg, s.c.) reduced the licking behavior. The dose of 250 mg/kg of A.A. (ED61), potentiated the inhibitory effect of dopamine D1 receptor antagonist, SCH 23390 (0.5 and 1 mg/kg, i.p.) but did not alter the inhibitory effect of dopamine D2 receptor antagonist, sulpiride (25 and 50 mg/kg, s.c.). These results suggest that the inhibitory effect of ascorbic acid on apomorphine-induced licking behavior is mediated by a dopamine D2 receptor mechanism.

POSTER 104
Effects of neonatal novelty exposure on exploratory behavior and basal HPA axis activity in adult rats
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Exposure of rodents to early life experiences is known to permanently affect adult brain functions concerning emotionality, stress response and synaptic plasticity. We have applied a "novelty exposure" protocol in neonatal rats of both sexes, from postnatal day 2 to 21, to investigate the effects of this early experience on the exploratory behavior, spatial working memory and basal HPA axis activity of these animals. This protocol differs from the widely used models of early handling or prolonged maternal deprivation, in that the only different stimulus experienced by the experimental group of pups is the environment of a novel cage. At 10 weeks of age the animals were behaviorally checked in a Y-maze task and one week later they were blood sampled and killed in basal conditions. Rats neonataly exposed to novelty ('novel' animals) made more entries in all Y maze arms (total entries), compared to their non-exposed siblings ('home' animals). Novel females made more entries and spent more time in the unknown arm, compared to home females. Home males spent more time than home females in the unknown arm, whereas this sex difference was not observed in novel animals. Home females spent more time in the start arm, compared to both novel females and home males. Basal corticosterone levels were differently affected in the two sexes: Exposure to novelty led to decreased corticosterone levels in males and increased levels in females, compared to 'home' animals of the same gender. In the paradigm used, neonatal exposure to novelty led to distinct sex-dependent alterations in the adult animals' exploratory behavior and basal HPA axis activity.

POSTER 105
Differential involvement of the central amygdala in appetitive versus aversive learning
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Understanding the function of the distinct amygdaloid nuclei in learning comprises a major challenge. In the present study, we employed c-Fos immunolabeling to compare the engagement of the lateral and central nuclei of the amygdala in appetitively and aversively motivated behaviors. This experiment was designed to extend our previous results with appetitive and aversive instrumental training in rats, which showed that the central amygdala (CE) responded, surprisingly, selectively to the appetitive conditioning only. Therefore, the present experiment was carried out on different species, mice, trained either for place avoidance or place preference (aversive vs. appetitive conditioning) in an automated learning system (INTELLICAGE). Again, much more intense c-Fos expression was observed in the CE after the appetitive training as compared to the aversive training. These data, obtained in two species and by means of novel experimental approaches balancing appetitive vs. aversive conditioning, strongly suggest that the central nucleus of the amygdala is specifically involved in appetitively motivated learning processes.
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POSTER 106
Fear conditioning in rats: is the N150 component related to shock anticipation?
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Amygdalar Evoked Potentials (EPs) of the conditioned stimulus (CS) can be elicited in a simple Pavlovian fear conditioning procedure (Knippenberg et al., 2002). Of particular interest is a slow negative component with a peak amplitude around 150 ms: it

increases dramatically after fear conditioning. Others (Paré & Collins, 2000) found a similar N150 component in the amygdala of the cat and demonstrated a progressive amplitude increase as cats anticipated the occurrence of a shock. We employed an aversive occasion setting task to test the hypothesis that this amygdalar N150 component represents anticipation to the shock.
Male Wistar rats (n=10) were chronically equipped with EEG electrodes aimed at the amygdaloid complex and electrodes for recording heart rate. After recovery rats were trained to press a lever according to a VI60 reinforcement schedule. A feature-negative occasion setting procedure (A+/XA-) was used. A Target (A; a train of six identical noise bursts, inter-burst interval: 4 sec) was followed by a foot shock when presented alone, but not when preceded by a Feature (X; light flashes, 10-sec duration). If the N150 elicited by A reflects an anticipatory phenomenon, than its amplitude should be large on A+ and small on XA- trials. EPs from the amygdala were recorded during training and extinction.
Rats discriminated between A+ and XA- trials: suppression of lever press activity and a larger increase in heart rate on A+ compared to XA- trials was found. Importantly, heart rate increased progressively during A+, indicating the presence of anticipatory fear on these trials. Preliminary analysis of the EPs again showed differences in the N150 before and after learning, however there were no differences between the two trial types. It can be concluded that despite clear physiological signs of anticipation towards the shock, the N150 can not be explained as reflecting shock anticipation.

POSTER 107

The subjective accentuation for different tempi in young, elderly and very old subjects

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The subjective accentuation paradigm has mainly been used to study temporal limits of integration mechanism in speech-disordered populations, as well as in healthy volunteers. However, very limited studies concern age-related changes in the performance on this task.
Thus, the aim of our study was to compare the performance of subjective accentuation task in young (aged 19-25 yrs), elderly (65-67), and very old people (95-103). Series of identical, 1 ms sounds were presented to the subjects with 5 different frequencies ranged from 1 to 5 sounds/s. The task was to create a subjective rhythm by the accentuation of every 2nd, 3rd or nth sound, thus, to create perceptual groups of sounds containing 2, 3 or more elements. The analyzed variable was the number of sounds in each group for particular frequencies. The number of integrated sounds decreased with the presentation rate, however, this relationship weakened with subjects' age. Moreover, for the slowest presentation rate (1 sound/s) centenarians integrated more sounds than subjects in younger groups. We found also the positive correlation between the number of integrated sounds at the fastest presentation rate (5 sounds/s) and cognitive status of subjects as measured by the Raven Progressive Matrices (young and elderly subjects) or Mini-Mental State Examination (centenarians).
The obtained age-related differences in the number of integrated sounds may be interpreted in terms of temporal aspects of information processing. Specifically, these differences may suggest the existence of age-related changes either in the frequency of attentional peaks (Jones' dynamic attending theory) or lengthening of the upper limit of hypothetical integration mechanism (Pöppel's hierarchical model of time perception). Supported by the KBN grant No PBZ-KBN-022/PO5/1999

POSTER 108

Discharge patterns of hippocampal cells during in vitro recorded theta rhythm

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In a present in vitro study we focused on cellular mechanisms responsible for production of theta rhythm in hippocampal formation slices perfused with carbachol (CCH). We characterize a single unit discharge patterns of 100 cells activated during CCH induced theta. In addition to typical theta related and nonrelated cells we described a novel type of theta related cells. Results are discussed in terms of data obtained in vivo. (Supported by grant 3 PO4C 008 24).

POSTER 109

Acute restraint stress effects on spatial memory and hippocampal glucocorticoid receptor activity

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The glucocorticoid receptor type II (GR), being a target for glucocorticoids, is an important modulator of stress response and spatial memory. Two other proteins play a crucial role in the receptor function: the chaperon protein HSP-70, enabling corticosterone binding and the steroid receptor co-activator SRC-1. In this study we examined the effect of an acute restraint stress applied for 6 hours, immediately upon acquisition of a hippocampal-dependent version of the Morris water maze task, on memory retrieval of male and female rats. Plasma cortocosterone levels following stress, and in the next morning, berore and after memory test, as well as the immunoreactivity of GR, HSP-70 and SRC-1 in the hippocampus of the aforementioned animals, immediately following memory test, were evaluated. Stressed male animals showed impairments in memory task compared to control males, while corticosterone levels between the two groups did not differ in the morning of the test. Performance of stressed females was not affected, while their corticosterone levels were still higher than the controls prior to the memory test. Nuclear GR immunostaining in the CA1 and CA3 area of the hippocampus was increased in stressed male rats, along with HPS-70 and SRC-1 staining. A significant translocation of GRs from the cytoplasm to the nucleus was witnessed in the CA3 area neurons of stressed male rats. In female animals no singificant

changes were observed after stress. We conclude that although the acute stress paradigm used caused a higher and longer lasting corticosterone response in female rats, it affected more the hippocampal gluococorticoid receptor function of male animals.
This work was supported by the 70/4/3480 grant of the University of Athens to E. Kitraki. Travel expenses and participation for O. Kremmyda was covered by the MEST-CT-2004-007825 "Sensoprim" EU program.

POSTER 110

Sex differences in processing of the affective visual stimuli as revealed by fMRI

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In the following study, using fMRI technique, we examined the sex differences in processing of emotionally loaded visual information. In the positive condition explicit comparison of men and woman yielded more pronounced activations in: occipital cortex in the male group and right superior temporal gyrus with bilateral parahippocampal gyri in female group.
In the positive condition comparison of man and woman sub samples showed stronger activations in: left insula, right temporal gyrus and left medial frontal gyrus in males and thalamus along with bilateral orbital cortex in females.
Activation of bilateral occipital cortex proves enhancement of visual processing of emotional slides as compared to neutral checkerboards. This might be attributed to top-down processes originating in the frontal areas of the cortex. In case of positive slides he more pronounced activation of occipital cortex in male subjects indicates that they allocate more atentional resources to the analysis of highly arousing positive stimuli. Common activations of insular cortex in negative condition are probably related to autonomic arousal accompanying watching emotional content as well as to the accompanying feeling of disgust. This activation was more pronounced in males. The activation of the thalamus along with orbital cortex in females might be indicative of the stronger activation of the pathway leading from amygdala to the frontal lobes via thalamus. In conclusion we have detected significant differences in emotional processing between the male and female subjects. Those differences however are quantitative rather than qualitative in nature. This implies that, excluding intensity, the very mechanism of emotional appraisal is largely common to both sexes.

POSTER 111

The effects of fornix lesions on timing behaviour in rats

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It has been proposed that episodic, or event-related memory is dependent on interactions between the hippocampus and the medial diencephalon. The present experiment assessed the timing aspect of event memory with respect to these anatomical substrates. We examined the effects of fornix lesions in rats, using a novel Pavlovian conditioning task that involved discriminating between two different durations of time. The task required an active memory trace to associate a conditioned stimulus (CS- 3s tone, CS+12s tone) with an unconditioned stimulus (US; food pellet) separated by time (10s trace interval). After 39 training sessions the task was modified by increasing the trace interval to 20s for a final 9 sessions. Both sham-control and fornix-lesioned animals learnt the discrimination, as evidenced by a greater duration of responding after the long tone (CS+) compared to the short tone (CS-). Responding was compared across the last 18 sessions of the task. Although the rats with fornix damage could discriminate between the two time intervals, the control rats showed significantly higher levels of discrimination. These findings provide further evidence of the involvement of medial-temporal brain structures in the temporal coding of events and provide a basis for comparing the contribution of other temporal and diencephalic regions.

POSTER 112

Genetic Polymorphisms Involved in the Regulation of Anxiety and Depression-Like Behaviour in Rodents

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Independent of gender, high (HAB) and low (LAB) anxiety-related behaviour rat and mouse lines were generated with selection pressure exerted on elevated plus-maze behaviour. HAB and LAB lines show extreme differences in anxiety-related indices in a variety of additional paradigms with unselected "normal" or cross-mated controls displaying intermediate behavioural scores. Resembling the clinical situation, HAB animals prefer passive coping strategies, indicative of depression-like behaviour, and show signs of a hyperreactive HPA axis.
In both animal models, the HAB phenotypes correlate with vasopressin (AVP) gene over-expression at the level of the hypothalamic paraventricular nucleus (PVN), likely to represent a final common pathway of trait anxiety and comorbid depression. In HAB rats, the AVP gene promoter, containing a number of SNPs, is more active, as revealed by allele-specific transcription studies in cross-mated HAB/LAB F1 animals. One SNP [A(-1276)G] conferred reduced binding of the transcriptional repressor CBF-A in the HAB allele, the consequent differential regulation of the AVP promoter resulting in an over-expression of AVP in vitro and in vivo. In LAB mice, to provide an opposite example, the dramatically reduced intra-PVN expression of AVP underlies both the non-anxious/non-depressive phenotype and signs of a central diabetes insipidus. Interestingly, in this line, a non-synonymous SNP [C(+4)T] is likely to cause an amino acid exchange in position 3 of the signal peptide (Val for an Ala), thus resulting in a less efficient AVP processing in the PVN and, finally, in cell death. Rescue approaches including antisense targeting and viral vector studies confirm the key role of inter-PVN AVP for the behavioural and neuroendocrine phenotypes. The combination of behavioural, neuroendocrine and molecular-genetic approaches will help to identify potential targets for anxiolytic/antidepressive interventions.

POSTER 113

Memory for object-place-context configurations is dependent on the hippocampus in the rat.

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The hippocampus is required for episodic memory, but its precise role is not understood. While Clayton et al (1998, 2001) showed that scrub jays have episodic-like memory for "what", "where" and "when", developing tasks to demonstrate similar abilities in rats, which are more amenable to neurobiological manipulation, is challenging. Eacott & Norman (2004) have taken an alternative approach, arguing that the "when" component can be replaced by other occasion setters, such as the context in which events occur. Using rats' spontaneous tendency to explore novel aspects of their environment (Ennaceur & Delacour, 1988), they have developed a task that involves rats remembering trial-unique configurations of objects, places and contexts. We aim to elucidate the extent of hippocampal involvement in this task.
Rats were exposed consecutively to two different contexts, each containing the same two objects (A & B). The positions of the objects were reversed in the two contexts. After a 2-min delay, the rat was placed in one of the contexts, and confronted with two identical copies of one of the two objects (e.g. A) placed in the same locations as those used during the exposure phase. Thus, one object-place configuration was novel and one was familiar for that context. Sham operated rats explored the novel object-place-context configuration significantly more than the familiar one during the test phase, but rats with complete bilateral excitotoxic hippocampal lesions were impaired. With a 5-min delay between exposure and test phases, neither group explored the novel configuration more than the familiar one. Control tasks testing memory for object-place and object-context configurations showed no differences between the groups, with both showing a preference for the novel configurations.
These data suggest that the hippocampus is necessary only when all three components of the event must be associated and remembered, and are consistent with the effects of fornix lesions reported by Eacott & Norman (2004).
Supported by BBSRC

POSTER 114

Involvement of dopamine D1/D5 receptors in spatial novelty acquisition, hippocampal LTP and LTD

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Dopamine D1-like receptors are comprised of D-1 and D-5 subtypes and have been shown to modulate hippocampal plasticity in vitro (Otmakova and Lisman, 1996, J Neurosci 16: 7478). Evidence that hippocampal dopamine (DA) plays a role in memory consolidation is generated not just from their known role in synaptic plasticity, but also from the physiologically suggestive localization of these DA receptors on hippocampal terminals, as well as from direct behavioral testing on learning and memory tasks. Our lab has previously shown that LTD is facilitated by novelty exploration (Manahan-Vaughan and Braunewell, 1999, Proc Natl Acad Sci: 8739; Kemp and Manahan-Vaughan, Proc Natl Acad Sci 2004: 8192). We investigated the involvement of D1/D5 receptors in long-term potentiation (LTP) and long-term depression (LTD) in the CA1 region of freely moving rats in both familiar and novel environments. Male rats underwent chronic implantation of a monopolar recording electrode in stratum radiatum of CA1 and a stimulation electrode in the Schaffer collaterals. Experiments were conducted in a familiar recording chamber, where the animals could move freely. The D1/D5 antagonist, SCH23390 or the D1/D5 agonist chloro-PB was infused, as a 5?l volume i.c.v. Low frequency stimulation (LFS, 1 Hz, 900 pulses) induced LTD, which lasted for at least 4h. LFS at 1Hz, 600 pulses was able to induce a short term depression (STD) which recovered after 1 hour. High frequency stimulation (100 Hz) induced LTP >24h. SCH23390 dose-dependently (30-120 nMol) impaired late-LTP. SCH23390 (120 nmol) significantly inhibited late-LTP while it completely abolished LTD induced by (LFS, 900 pulses) and prevented novelty-induced facilitation of STD into LTD. Chloro-PB (120nMol) had no detectable effect on LTP induction or maintenance. However, chloro-PB (120 nMol) transformed STD into robust LTD lasting over 4 hours. These findings lend support to the role of dopamine D1-like receptors in mediating changes in synaptic strength associated with learning a novel environment.

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POSTER 115

Mental number line disruption in a right neglect patient

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Right brain damaged patients with unilateral neglect fail to process the perceptual and/or imagined contralesional space. A typical clinical test for the diagnosis of neglect is the line bisection task where subjects are asked to mark the midpoint of a horizontal line: the patients usually place it rightwards. The same pattern can be observed at an imaginative level: when patients have to state the midpoint number given two numbers that define an interval, they shifted it to the right. We investigated whether MD, a left brain damaged patient with right neglect and with intact numerical and arithmetic skills, could show the same disruption of the mental number line. MD was horally presented two numbers and was asked to choose the midpoint one. The intervals varied in size, kind of extremes (i.e. units, teens or first teens) and order (i.e. increasing or decreasing). MD significantly placed the midpoint leftwards mirroring her deficits in bisecting lines. This behaviour increased as a function of the interval size but was not affected by the kind of extremes and by the order. This latter result suggests that the mental number line is canonically oriented. In conclusion MD performance is symmetrical to the one commonly observed in left neglect patients. These data confirm and support the idea of an important spatial components in number processing.

POSTER 116

Influence of rat strain and supplier on general behaviour and spatial learning

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Neuroscientists commonly employ rats to elucidate the molecular and genetic underpinnings of complex processes such as learning and memory, with Wistar and Sprague Dawley (SD) being the most common strains. Despite this fact few direct comparisons have been reported at the level of behaviour, learning and memory. Strain differences cited in the literature are further complicated by the issue of animal supplier and rearing environment effects.
To investigate this further we sourced male and female breeders of both strains from two suppliers (Harlan and Charles River Laboratories (CRL)) and bred them in our animal facility. Throughout the study all the animals were housed in identical conditions thus eliminating any environmental variable.
We found no strain or supplier effect on water maze acquisition (e.g. Wistar vs SD from Harlan escape latencies; 24.76s ± 6.064 to 7.205 ± 1.943 vs 29.547s ± 3.516 to 12.368s ± 2.882; $p > 0.05$) but this uniformity amongst strain/supplier did not extend to probe trial performance or general behaviour. All animals regardless of strain/supplier displayed a bias for the target quadrant immediately following the last training session. However, 24h later a supplier effect within the Wistar became evident with rats from Harlan failing to show a bias for the target quadrant (% time spent in target quadrant; 19.9% ± 3.119 vs chance (25%); $p > 0.05$) Furthermore strain differences in general behaviour within Harlan animals were seen in both locomotor activity (Wistar vs. SD; 231.1 ±10.31 vs 189.9 ± 7.41; $p < 0.001$) and rearing (Wistar Vs SD; 44.0 ± 1.434 vs 35.76 ± 0.7162 $p < 0.001$). There was also a supplier effect in the Wistars within this parameter (Harlan vs CRL, 44.0 ± 1.43 vs 32.4 ± 1.347; $p = 0.0012$). These results suggest that supplier and thus rearing environment play a dominant in an animal's behaviour and memory consolidation.
All experiments were approved by UCD's animal ethics committee
Funded by Enterprise Ireland. KJM and CMR are both SFI investigators

POSTER 117

Anterior thalamic lesions, postoperative enrichment, spatial memory and functional recovery

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The extensive neural connections between the anterior thalamic nuclei (ATN) with the hippocampal system may explain the overlapping amnesic syndromes associated with diencephalic and medial temporal lobe brain injury. In rats, lesions to the ATN or hippocampus both produce spatial memory deficits, which further implicates these structures in a single functional memory system. The question of possible amelioration of ATN lesion deficits has not, however, been investigated. Housing conditions influence the structure and function of the intact hippocampus and sometimes modulate performance on memory tasks after hippocampal system lesions. Here, we provide a summary of the first study of the influence of postoperative enrichment, compared with standard group housing, after ATN or sham lesions in female PVGc rats (n for ATN-Enriched - 10; Sham-Enriched - 12; ATN-Grouped - 10; Sham-Grouped -12). Preoperatively trained rats were re-tested after 30 days of continuous enriched housing, with 2-hr per day of enrichment thereafter, on non-matching to sample spatial working memory in a T-maze. Starting 120 days post-surgery, acquisition of pattern separation for reference memory spatial items was examined in a 12-arm radial maze (wide, 5 arms separate; medium, 3 arms separate; close, zero arms separate). Enrichment clearly ameliorated the ATN induced spatial memory deficit in the T-maze but had little effect on the ATN lesion-induced deficit on this second task. Task-dependency, preoperative versus postoperative experience and time since continuous enrichment may explain these differences, but these findings suggest promise for potential recovery of function after ATN lesions. The T-maze effect is currently being re-examined in the context of delayed postoperative enrichment.

POSTER 118

Serotonin in the ventral striatum in view of anxiety-related behaviour

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It is well-known that central serotonin (5HT) is involved in anxiety. One classical hypothesis states that a general loss of 5HT in the brain leads to a reduction of anxiety-related behaviour. Other studies, however, have shown that certain brain sites of serotonergic innervation, like the hippocampus, amygdala, prefrontal cortex, and periaqueductal grey matter are relevant for anxiety-related behaviour. Also, Schwarting et al. (NeuroReport 9´98, 1025-29) showed that the ventral striatum is supposedly involved in such processes, since it was found that rats with different individual levels of anxiety-related behaviour in the elevated plus-maze differed with respect to 5HT concentrations specifically in the ventral striatum. Further studies (Ho et al., Behav. Brain Res., 136´02, 1-12) yielded that such rats also differ with respect to learning of active avoidance behavior.
In order to experimentally analyse the possible relationships between ventral striatal 5HT and anxiety-related behaviour, we have started a series of experiments, where we analyse the behavioural and neurochemical outcome of serotonergic lesions, performed by bilateral ventral striatal injections of the neurotoxin 5,7-dihydroxytryptamine in male Wistar rats. In these experiments, we systematically vary the dose of the toxin, and apply different reuptake inhibitors in order achieve substantial and selective damage of serotonin in the ventral striatum. Here, we report whether and how these variables affect behavioural outcome, focussing on unconditioned avoidance behaviour in the plus-maze, activity in the open-field, and active avoidance learning in the shuttle box. Furthermore, we show how these effects are related to transmitter depletion in- or outside the ventral striatum.
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POSTER 119

Excitotoxic damage to the retrosplenial cortex selectively impairs active avoidance learning in Wistar rats

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Limbic system has been traditionally viewed as an array of brain structures involved in the regulation of emotional behaviors and in learning and memory. Retrosplenial cortex (RC), being interconnected with several other parts of the limbic system, such as the hippocampal formation, rostral thalamus, and anterior cingulate cortex, has been repeatedly shown to be important for spatial navigation learning. Yet, the involvement of this region in other "limbic" functions is less well documented. In the present study, we addressed this issue by comparing the performance of rats with damaged RC and of sham-operated rats on a battery of behavioral tests. Male Wistar rats were used as subjects. Bilateral lesions were produced by infusing a solution of neurotoxin, NMDA, into RC. In an open field, the locomotion activity in the outer and inner zones of the apparatus and the defecation scores did not differ between the groups. Likewise, RC-lesioned rats and sham controls performed similarly in the elevated plus maze, suggesting that the level of anxiety and emotional reactivity to novelty were not affected by lesions. Following training in the foot-shock fear conditioning chamber, the amount of freezing behavior was similar in both groups in the context test, but in the tone test, RC-lesioned rats spent somewhat more time freezing compared with controls. The latter effect was, however, found to be non-significant. There was no effect of the lesions on the passive avoidance behavior of rats (step-through method). Yet, learning of an active avoidance task (two-way shuttle box paradigm) was dramatically impaired in RC-lesioned animals. These findings, being consistent with those previously obtained by other investigators in rabbits, suggest that, at least in rodents, RC may be important for the regulation of neuronal activity associated with voluntary behaviors.

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POSTER 120

Beyond conflict: functional substrates of performance monitoring

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A relatively large body of neuroimaging literature has addressed monitoring with regard to error detection, error likelihood or response conflict and has implicated the anterior cingulate (ACC) as a key structure. The present study attempted to investigate monitoring with regard to the ability to evaluate internal goals against externally generated changes in task difficulty. 16 subjects were required to complete a visual search task by indicating under time pressure if a target was present or not. Critically, subjects also had an option to reject trials deemed too difficult. The neurocognitive processes involved in the decision to reject a trial were contrasted with error trials. Event-related fMRI showed greater activation for rejections in ACC and left BA9, indicating their respective involvement in evaluating the possibility of poor performance and implementing task goals. The Insula was more activated when making errors, consistent with an error-related arousal response.These results suggest that the decision to reject reflects the cognitive process of monitoring, and that the role of the ACC is more than just detecting errors and conflict.

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POSTER 121

The effects of left and right selective amygdalohippocampectomy on everyday memory, discourse production and spatial representation.

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Episodic memory depends on the integrity of the medial temporal lobe; the critical role of the hippocampus has been extensively researched in patients following hippocampal excision for medically intractable unilateral temporal lobe epilepsy (TLE). O'Keefe and Nadel (1978) argued that the left hippocampus contains a language-based semantic map, which works with the spatial map in the right hippocampus to form the basis for long-term memory for verbal episodes and narratives. They also predicted that left hippocampal damage would result in language deficits. Verbal memory loss after left temporal lobectomy is well documented, but previous research has focused entirely on the use of verbal tests (e.g. fluency and naming) in assessing lexical and semantic memory. Here, we describe novel ways of investigating the episodic memory and discourse production deficits of post-operative left and right amygdalohippocampectomy (LAH and RAH) patients relative to normal matched controls (NC). Participants also completed novel spatial tasks (i.e. landmark recognition, location and pointing, and route description). The results show that (1) both the recall of personally-relevant events and the use of language in describing such events are significantly impaired in post-operative LAH patients relative to RAH and NC groups, (2) the RAH group were most impaired at the landmark recognition and location tasks relative to LAH and NC groups and, (3) the LAH group showed the greatest deficits in the route description task relative to RAH and NC groups. These results provide the first confirmation of O'Keefe and Nadel's predictions; we posit that the left hippocampus plays a vital role in verbally-mediated episodic memory, and also an unsuspected role in the real-time formulation of linguistic utterances.

POSTER 122

Emotionally negative stimuli are resistant to priming

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Emotional nature of stimuli may exert an influence on memory processes. The aim of our study was to investigate the role of affective valence of visual stimuli in repetition priming. Neutral and emotionally negative words and images taken from International Affective Picture System (IAPS) were shown in the right (RVF) or in the left visual field (LVF). Each of the stimuli was repeated twice, with 2 to 4 intervening stimuli. The subjects' task was detection of a stimulus. Responses were given by index finger of the left (LH) and right hand (RH). Reaction times (RTs) were measured and analyzed. The effects of repetition priming were significant for neutral stimuli (both words and images) presented either in the LVF or RVF with responses given by either hand: repeated items were detected faster than the new ones. For emotionally negative items, generally no priming was observed, suggesting the unchanged level of attention for repeated presentation. However, the direct stimulation of the right hemisphere (with the RH responses) resulted in repetition priming, implying the involvement of the right hemisphere in implicit memory for emotionally negative information. Effects of priming – if present – were similar for words and images. Our results indicated that: (i) emotional valence of stimuli is automatically evaluated as soon as stimulus was detected, i.e., at the very early stages of processing of the incoming visual information (ii) negative stimuli were more resistant to priming (iii) at early stages of visual processing, hemispheric differences were related exclusively to the emotional content of stimuli.

POSTER 123

Facilitation of extinction of conditioned fear in the rat cortex and amygdala

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In auditory fear conditioning, repeated presentation of the tone in the absence of the shock leads to extinction of the acquired fear response. Both the infralimbic cortex (IL) and the basolateral amygdala (BLA) are implicated in extinction. Here we analyze the role of the GABAergic system in extinction in these brain regions. We microinfused a low dose of the ?-aminobutyric acid (GABA)A agonist muscimol into the IL or BLA. Muscimol infused to IL before extinction training (but not after either short- or long extinction training), resulted in long-term facilitation of extinction. Infusion of muscimol to the BLA, following a short training session, transiently facilitated extinction. The differences in the temporal parameters of the effects of muscimol in the IL or BLA, suggest differential involvement of these structures in long-term extinction of fear memory. We propose that while the IL triggers the onset of extinction and is further involved in its long-term storage, the BLA is involved in the consolidation of fear extinction memory. Understanding the interaction between the amygdala and the prefrontal cortex in extinction of fear is of interest, since these brain regions are implicated in the persistence of maladaptive fear in post-traumatic stress disorder (PTSD) and phobia.

POSTER 124

Intraspecific communication in female mice: reinforcing properties of male sexual pheromones

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Rodents use chemical senses for recognition of conspecific gender and social status. Thus, using two-choice preference tests, adult female mice explored more intensely bedding soiled by conspecifics (females, males or castrated males) than clean bedding (Experiment 1). This behaviour might be indicative of the reinforcing properties of pheromones, which is especially likely for sexual pheromones since females explore preferentially male- vs female-soiled bedding.

This hypothesis was tested with the place preference paradigm (Experiment 2), using rectangular cages where three groups of female mice had access to two dishes (located on opposite sides) containing bedding, either clean or soiled by females, castrated males or intact males, respectively.

After a control test (clean bedding in both sides, C/C), females were exposed to soiled bedding systematically located in the right or left side of the cage in a counterbalanced way in each group (four sessions). Then, a C/C test was used to check the preference for the location where soiled-bedding was presented (place preference test). Extinction was analysed during the next days(Experiment 3).

Statistical analysis demonstrates that male pheromones are attractive and induce place preference. In contrast, neither female (which is very attractive) nor castrated male pheromones (not attractive) generate place preference. Compared with other kinds of learning, place preference induced by sexual pheromones extinguishes quickly. Intense exploration of female-soiled bedding might be the result of countermarking, which like other agonistic behaviours is unlikely to be reinforcing.

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POSTER 125

Visual and Motor Imagery Training

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Visual and motor imagery have become valuable techniques in the rehabilitation of neurophysiological disorders. However, most of the research pays no attention to the problem of individual differences in imagery abilities and no attempt has been made to train patients in imagery before the rehabilitative program begins. Here, two imagery-training schemes are presented, one focussing on visual imagery and one on motor imagery. The schemes were created according to four guiding principles, namely, relaxation, sensory awareness, practice and theoretical frameworks for visual and

motor imagery (proposed by Kosslyn, 1994 and Jeannerod, 2001, respectively). They were designed to last four weeks, which included 11 hours of individual training per week with ten minutes of homework each night in between sessions. The efficacy of each scheme was tested by training 10 low imagery participants and comparing their pre-post training performance with that of 10 low imagery control participants, who did not engage in training but simply read a piece on how imagery should be trained. A variety of subjective and objective measures of imagery were used to assess imagery ability. The results showed that motor imagery trainees improved significantly more than controls but visual imagery trainees did not. We concluded in favour of the motor imagery scheme as a successful method for improving motor imagery ability.

POSTER 126

Ratio of excitatory and inhibitory transmission in the medial prefrontal cortex shows a functional alteration in two animal models of schizophrenia

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Microdialysis in the medial prefrontal cortex (mPFC) was used to investigate the effects of isolated rearing or maternal deprivation on basal and KCl-stimulated changes to the ratio of dialysate glutamate to GABA levels, and their response to chronic clozapine treatment. In the isolated group young adult rats were weaned on postnatal day 25 (P25) and individually housed while the maternally deprived group experienced a single 24-hour period of maternal deprivation on P9. A socially reared group acted as controls.

The basal glutamate:GABA ratio (nM:nM) was 1010±699 (n=6) in vehicle treated social controls but was reduced by 75% and 92% respectively to 251±298 (p=0.047 v's control+vehicle, n=6) and 79±67 (p=0.0177, n=5) in both isolated and maternally deprived rats. Intra-mPFC KCl (100mM, 20mins) reduced the glutamate:GABA ratio by 74%, 15% and 34% to 258±187, 214±124 and 52±28 in the control, isolated and maternally deprived rats respectively. Clozapine (5mg/kg i.p. daily for 10 days) reduced the basal glutamate: GABA ratio by 35% to 635±21 (p=0.085 v's control+vehicle) in the social control group without affecting those in isolated or maternally deprived rats. Clozapine failed to effect the KCl-induced reduction in the glutamate:GABA ratio in any group.

These findings show that isolation rearing and maternal deprivation reduces the basal glutamate:GABA ratio in the mPFC and this relative increase in inhibition may, underlie deficits observed in these animal models. The finding that intra-mPFC KCl-stimulation is associated with a reduction in the glutamate: GABA ratio in all groups suggests that the maintenance of basal excitatory: inhibitory tone in the mPFC is an active process.

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POSTER 127

Group Cognitive Behavioural Therapy for Major Depressive Disorder: relationship to neuropsychological function and measures of stress

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Major Depressive Disorder (MDD) is a debilitating psychiatric disorder associated with impaired cognitive function. Psychological therapies, particularly Cognitive Behavioural Therapy (CBT), are effective in treating MDD. However, few studies have examined the interaction between patients' neuropsychological function and their response to CBT. Here, we assessed the neuropsychological profile of sixteen patients (eight female; mean age 47.56; SD 7.87) with MDD before and after CBT. Patients were randomly assigned to one of two groups each receiving eight weekly CBT sessions and two follow-up sessions. Group 2 started CBT eight weeks after Group 1. Neuropsychological assessments focusing on memory and attention and a Stress Profile were completed pre- and post-treatment. Beck Depression Inventory (BDI-II) scores were recorded at each CBT session. There were no group differences in baseline levels of depression. However, differences in BDI scores were observed at Session 8 ($F(1,12)=5.473$, $p<.05$) and post-CBT ($F(1,11)=7.107$, $p<.05$); Group 1 patients showed significantly lower BDI scores compared to Group 2 patients. Both groups also differed in visual memory (Rey Figure immediate ($F(1,13)=7.451$, $p<.05$) & delayed recall ($F(1,13)=5.091$, $p<.05$) and spatial memory (Landmark Location $F(1,13)=8.786$, $p<.05$). Post-CBT, both groups showed significant improvements in perception of memory function (Everyday Memory Questionnaire $F(1,13)=6.260$, $p<.05$), spatial memory (Landmark Recognition $F(1,13)=5.780$, $p<.05$) and verbal memory (RAVLT $F(1,13)=6.350$, $p<.05$). Significant improvements in Positive Appraisal ($F(1,13)=5.544$, $p<.05$) and Psychological Wellbeing ($F(1,13)=7.090$, $p<.05$) were also observed. Neuropsychological function may be an important factor to consider in therapeutic intervention for MDD.

The research indicate that the functional variations of neurons are accompanied by the quantitative and qualitative variation of lyzozom from their cytoplasm.

POSTER 128

The cue-platform association in the watermaze task builds up gradually during acquisition through locomotion, and not whilst on the platform.

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NUI Maynooth

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The Morris Watermaze is a popular paradigm used in the study of spatial navigation. Research using this technique has shown that, while navigating animals can use a combination of both allocentric and egocentric strategies in locating the hidden platform, they focus

mainly on allocentric visual cues for successful navigation. Past studies have found that a conflict between allocentric and egocentric information can impair the animals' accuracy when searching for a hidden platform. Successful navigation is dependent upon clear cues which can be easily associated with the target location (i.e. the hidden platform). The current study aims to establish where and when this cue-platform association is built up. Animals were trained to locate a hidden platform in the watermaze for 1, 2, 3, 4, or 5 days. Their swimming patterns, along with their behaviour on the platform was monitored. Retention was assessed 7 days post acquisition through a probe trial, for which the animals were split randomly into control and experimental groups. For the experimental group, external cue layout was rotated by 180o, while cues remained unchanged for controls. Results indicate that the cue-platform association is built up during locomotion and not while the animal is on the platform. In addition, we have found that this association is built up gradually during acquisition. Differences in accuracy between control and cue-rotated groups suggest an influence of egocentric cues during the final days of acquisition. For these days, the experimental group showed impaired accuracy in searching for the platform when compared to controls. We propose that it is during these final days that animals tighten the accuracy of their search for the hidden platform. This research was funded by the Irish Research Council for the Humanities and Social Sciences, the HRB and the Irish Research Council for Science, Engineering and Technology.

POSTER 129

Subliminal visual stimuli yield inhibition of return but not facilitation.

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When an uninformative cue is presented in the periphery of the visual field and after a varying stimulus onset asynchrony (SOA) a target is presented at the cued or uncued location two effects can be observed: at short SOA the reaction time (RT) of subjects is faster at the cued rather than at the uncued location (facilitation). In contrast, at long SOA RT is faster at the uncued than cued location (inhibition of return, IOR). In the present study we tried to assess the contribution of a subliminal uninformative cue to IOR. While a visible cue produced both a facilitation (8.21 ms) and an IOR effect (10.20 ms), a sub-threshold cue produced only an IOR effect (3.59 ms). The main thrust of this experiment is that IOR, but not early facilitation, can be obtained by an unconscious processing of the cue and this may cast light on the differential neural bases of these two phenomena.

POSTER 130

The effects of systemic amphetamine treatment on the US-pre-exposure effect and latent inhibition in C57BL/6J mice

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In associative learning, pre-exposure to either the to-be-conditioned stimulus (CS) or unconditioned stimulus (US) can interfere with the subsequent development and/or expression of the conditioned response (CR). These phenomena are commonly referred to as latent inhibition (LI) and the US-pre-exposure effect (USPEE), respectively. While ample experimental and clinical evidence suggests an important role of central dopamine in the regulation and modulation of LI, the psychopharmacological profile of the USPEE has been sparsely explored. Recent data, at least in mice, highlighted the possibility that the USPEE, similar to LI, might also be under the critical influence of the dopaminergic system. The present experiments in C57BL/6J mice aimed at evaluating the effects of systemic amphetamine (2.5 mg/kg, i.p.) on the development and/or expression of LI and the USPEE in active avoidance learning with tone as the CS, and electric foot shock as the US. First, we assessed the efficacy of amphetamine to disrupt LI and the USPEE giving the drug before both pre-exposure and conditioning. Next, in order to further clarify whether amphetamine exerts its action on the acquisition and/or expression of the two pre-exposure effects, amphetamine was injected prior to pre-exposure alone, conditioning alone, or prior to both sessions. We found that LI and the US-pre-exposure effects were similarly disrupted by systemic amphetamine when the drug was given prior to pre-exposure and conditioning. However, when amphetamine was administered on the pre-exposure day alone, only the USPEE was disrupted. In contrast, administration of amphetamine on the conditioning day alone only resulted in the loss of LI. These results support our previous finding in taste aversion conditioning that the USPEE, similar to LI, is critically modulated by dopaminergic mechanisms. By showing that amphetamine prior to pre-exposure alone disrupted only the USPEE, and amphetamine administration prior to conditioning alone only disrupted LI, we highlight for the first time that the two pre-exposure effects differ in their sensitivity to dopaminergic manipulation during their acquisition and expression phases.

The present study was supported by the Swiss Federal Institute of Technology. BKY received additional support from the National Centre of Competence in Research: Neural Plasticity and Repair, funded by the Swiss National Science Foundation.

POSTER 131

Progression of cognitive alterations in a transgenic mouse model of Alzheimer's Disease overexpressing mutant hAPPswe

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Progressive changes in cognitive function reflecting the spatio-temporal pattern of ?-Amyloid peptide (Abeta) deposition were investigated in 7-month and 14-month of age Tg2576 mice over-expressing the human mutant amyloid precursor protein (hAPP). Here we show that, at 7 months of age, Tg2576 mice exhibited a

selective deficit in hippocampus-based operations including a defective habituation of object exploration, a lack of reactivity to spatial novelty, and a disruption of allothetic orientation in a cross-shaped maze. At 14 months of age, Tg2576 mice displayed more dramatic behavioural abnormalities since they failed to react to object novelty and exclusively relied on motor-based orientation in the cross-shaped maze. However, an impaired reactivity to spatial and object novelty possibly reflecting age-related attention deficits also emerged in aged wild-type mice. These findings further underline that early cognitive markers of AD can be detected in Tg2576 mice before Abeta deposition occurs and suggest that, as in humans, cognitive deterioration progressively evolves from an initial hippocampal syndrome to global dementia because of the combined effect of the neuropathology and aging.

POSTER 132

Neural basis of complementary functions to response bias in the centromedian nucleus of thalamus

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Activity in several areas of the human and monkey brain increases when a subject anticipates events associated with a reward, implicating a role for bias of decision and action. However, in real life, events do not always appear as expected, and we must choose an undesirable action. Over half of the neurons in the monkey centromedian (CM) thalamus were selectively activated when a small-reward-action was required when a large-reward-option was anticipated. Electrical stimulation of the CM after a large-reward-action request substituted brisk task with sluggish performance. These results suggest involvement of CM in a mechanism complementary to decision- and action-bias.

POSTER 133

Anterior thalamus and retrograde memory

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Of the various regions in the limbic thalamus, the anterior thalamic nuclei (ATN) seem to be particularly necessary for normal spatial memory function in anterograde tests. However, little research so far has examined the possible involvement of ATN in retrograde amnesia. In the current study rats were presented with five different memory tasks prior to surgery: spatial location memory, object-place recognition, object recognition, odour recognition and social transmission of food preference. The order that rats learned the tasks was counterbalanced so that each lesion group contained approximately 50 rats, 10 of which had begun to learn each task at one of five different temporal periods preceding surgery (i.e. one, two, three, four or five weeks). Surgery occurred within three days after learning the fifth task. Surgical groups consisted of NMDA lesions of the anterior thalamic region (anterodorsal, anteromedial and anteroventral nuclei), the medial thalamic region (central and medial segments of the mediodorsal thalamic nuclei and intermediodorsal nucleus) or the lateral thalamic region (intralaminar nuclei and lateral segments of the mediodorsal thalamic nuclei) or sham surgeries. Ten days following surgery, rats' memory of the five tasks was retested over consecutive days. Initial results indicate that the anterior thalamic region, in particular, is also necessary for the normal function of spatial retrograde memory.

POSTER 134

A physiological and behavioral investigation of two animal models of schizophrenia: effect of environment and clozapine

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In the present study we investigated the effects of a specific environmental disturbance on body weight, cerebrovascular status and basal and KCl-stimulated changes in behaviour four days following microdialysis surgery in the isolated rearing and maternal deprivation rat models of schizophrenia and their response to chronic clozapine administration. In the isolated group young adult rats were weaned on postnatal day 25 (P25) and housed individually while the maternally deprived group experienced a single 24-hour period of maternal deprivation on P9. A socially reared group acted as controls.

Mean body weights (g) measured prior to microdialysis surgery days were similar in both the vehicle treated social controls and the maternally deprived rats (241±8 and 230±7 respectively) but were increased by 16% in the isolated rats (280±7, $p=0.003$ v's control+vehicle, n=7-8). However, only the maternally deprived rats showed a prolonged weight loss which was maximal 24hrs following microdialysis surgery compared to clozapine treated rats (-5±0.07% $p=0.0454$ v's maternally deprived clozapine).

Intra-mPFC bleeding as scored in postmortem brain slices and both basal and KCl-stimulated increases in locomotion and behavioural reactivity were similar across all three vehicle and clozapine treated groups. These findings indicate that the weight gain associated with social isolation is not related to changes in measured behavioural activity. Furthermore, the ability of clozapine to reverse the decrease in body weight associated with microdialysis surgery in the maternally deprived rats without influencing behavioural activity suggests a unique metabolic effect of clozapine in this group.

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POSTER 135

Olfactory Discrimination Learning in Tg2576 Transgenic Mouse Model of Alzheimer's Disease

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There is considerable evidence that pre-clinical and early stages of Alzheimer's Disease (AD) are associated with olfactory dysfunction, in particular olfactory discrimination. It is currently unknown whether olfactory discrimination problems known to exist clinically are capitulated in animal models of AD. We investigated olfactory discrimination in the Tg2576 transgenic mouse model of AD. Tg2576 mice have been shown to exhibit elevated levels of beta-amyloid (abeta) peptides and plaques, and a variety of cognitive deficits. Olfactory discrimination was investigated using an odour-reward association task which required mice to associate specific odours (e.g. lemon) with food reward over a number of trials and subsequently to discriminate those odours previously paired with reward from odours that had not been associated with reward. For comparison purposes we investigated two cognitive tasks that have previously been shown to be disrupted in Tg2576 mice, spatial navigation in water-maze and spontaneous alternation in a T-maze as well as open field measures of anxiety.
Wild-type and Tg2576 mice showed no differences in their olfactory discrimination ability in the odour reward association task, mean errors (+/- sem) at test (WT: 1.4 +/- .3, Tg2576: 1.63 +/- .4). A significant difference was however observed in mean % spontaneous alternation scores between WT (75 (+/- 2.8) and Tg2576 (64+/- 2.31) confirming previous findings ($F_{1,60}$ =8.80, $P<0.005$). Water maze performance was notably poor, with 75% of mice displaying floating or thigmotaxic behaviour, but showing no correlation with open field anxiety measures, which has been suggested as an explanation for these behaviours. These data suggest that olfactory discrimination dysfunction seen in human AD is not capitulated in animal models of the disease, notwithstanding our confirmation of the replicability of previously suggested spontaneous alternation deficits in these mice.

POSTER 136

Frequency-dependent processing in whisker related neurons of the nuclei Principalis, Oralis and Interpolaris of the rat.

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In rats the vibrissae are an essential and high-resolution sensorial input. When a rat is in a quiescent state, typically do not move their vibrissae and a novel contact with an external stimulus occurs in a frame of a low frequency whisker movement (<1 Hz). On the other hand when the animal are involved in a exploratory behaviour sweep their vibrissae move at frequencies of 4-12 Hz in a rhythmic posterior-anterior motion. Recent studies have described frequency-dependent modulation of somatosenorial information in the ventral posterior medial nucleus of the thalamus (VPm) and in primary sensory cortex (SI). The aim of our work is to study this frequency-dependent modulation in the trigeminal sensory complex. We have recorded extracellular activity of neurons in principalis (Pr5), interpolaris (Spi5) an oralis (Spo5) trigeminal nuclei while we stimulated a single whisker by means of air puffs at different frequencies (1-40 Hz). Pr5 and Spi5 neurons present characteristics similar than those described in VPm and SI neurons showing a wide variety of frequency-dependent filter characteristics, including "low pass", "high pass" and "band pass". On the other hand Spo5 neurons do not present filtering stimuli characteristics. Pr5 neurons allow frequencies between 7-11 Hz to pass, while Spi5 allow frequencies between 3-8 Hz. Filter frequencies of Pr5 and Spi5 neurons are complementary and fit the optimal whisking frequency. These study suggest that low-frequency stimulus processing is modulated in a first moment by Pr and Int whisker related neurons. According with the actual knowledge this is a first approach to compare the filtering properties in the different whisker to barrel pathway. This work is supported by Grants EU-IST-2001-34892, EU-IST-2001-34893, CICYT SAF2002-10935-E, CICYT SAF2002-10934-E, CAM 8.5/30/2003 and BEFI02/1767.

POSTER 137

Corticosterone Controls the Termination of the Infant Rat's Attachment Sensitive Period

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Neonatal rats learn to prefer odors paired with pain, as is illustrated by the delayed ontogenetic emergence of fear conditioning until postnatal day 10 when the amygdala becomes incorporated into the learning circuit. This early neonatal period is referred to as the sensitive period when learning to prefer the mother's odor is required for attachment and survival. Here we show that low corticosterone (CORT) levels during the first 9 days of life appears to prevent pups from learning fear (avoidance) from odor-shock (0.5mA) pairings and underlies the unique learning attenuation found during the sensitive period. We paired an odor with 0.5mA shock in either sensitive period (PN8) or postsensitive period (PN12) pups while manipulating CORT levels. We then assessed preference/aversion learning and amygdala participation during acquisition (2-DG autoradiography). While sensitive period saline Paired odor-shock pups continued to learn an odor preference, Paired odor-shock CORT (3mg/kg, ip) PN8 pups showed a precocious odor aversion and neural activity within the odor learning circuit similar to that expressed by postsensitive period pups (increased activity in posterior piriform cortex and the amygdala's cortical, basolateral/lateral and medial nuclei but decreased activity in the olfactory bulb and anterior piriform cortex). In postsensitive period pups (PN12), control saline Paired odor-shock pups showed an odor aversion, although CORT depletion adrenalectomy (ADX) pups showed odor preference learning and an odor learning circuit characteristic of the sensitive period (nonparticipation of the amygdala, decreased posterior piriform cortex activity and increased olfactory bulb and anterior piriform cortex activity).These results suggest CORT has an important role in the developmental emergence of olfactory fear conditioning with a unique role of changing preference conditioning to aversive conditioning. This sensitive period CORT action is in sharp contrast to its role in the adult where it either strengthens or weakens learning. Since stimulation of pups by the mother modulates endogenous CORT levels, these data suggest that the quality of maternal care may temporally alter the sensitive period.
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POSTER 138

Anterograde Amnesia for Spatial Relationships in Topographical Disorientation

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Topographical disorientation is often associated with a complex cognitive impairment in patient who suffered an extended brain damage in the context of dementia, confusional states or visuo-perceptual deficits. There are, however, few cases who revealed a specific topographical disorientation syndrome in absence of a diffuse cognitive impairment. We report the description of a 24 years old woman, R.G., who suffered from an hemorrhagic small lesion into the medial right temporal lobe. After two years from hospital discharging the patient revealed a persistent spatial orientation deficit. . In particular, she showed an impairment in memorizing environmental landmarks, the physical characteristics of which are correctly perceived but not remembered, associated with an inability in recalling the location of different spatial landmarks. The patient reports a selective impairment of the ability to find one's way in new environments in absence of other cognitive disorders. We aim in presenting the neuropsychological assessment that was able to detect the anterograde amnesia in R.G.. More specifically, in addiction to a standardized neuropsychological evaluation phase, we intend to introduce a situated assessment approach through which it was possible to highlight patient's everyday difficulties in managing unknown environments. The proposed evaluation focused on the investigation of:

a) individual spatial abilities (utilizing laboratory simulations and ecologically context mazes)
b) right /left orientation capacity
c) the presence/ absence of topographical agnosia (for familiar and unfamiliar buildings)
d) the possibility to use visual imagery (for personal and new objects)
e) the capacity of memorizing new information in terms of "what and where"

Evaluation results show that R.G. suffers from a cognitive impairment focused on the acquisition of spatial relationships in unknown contexts. Conclusions support the definition of a selective anterograde topographical impairment in patient with a right temporal lobe damage.

POSTER 139

The human frontal eye fields in attention and eye movements

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Human frontal eye fields are classically described in terms of their role in oculomotor control. However, findings in monkeys challenge this view, with lesions producing effects on visual performance (Latto & Cowey 1972) and, more recently, electrophysiological recordings showing that FEF neurons play a perceptual role in visual processing independent of eye movements (Thompson et al 1997). Using small visual stimuli, such that eye movements are neither required nor necessary for successful performance, and presentation durations shorter than typical saccade latencies, TMS has been used to evaluate the role of FEF in visual performance in humans. TMS over FEF disrupts performance of visual search for a target defined by a conjunction of features but not for a target defined by a single attribute in tasks matched for performance in terms of d'. Furthermore, the involvement of FEF is early and consistent with the timing of visual responses seen for this area in the macaque. Increases in saccade latencies are also seen when TMS is delivered over frontal eye fields (in contrast to the excitatory effects seen for TMS over, for example, the hand motor area). Using a task where saccade type is instructed by a visual stimulus, both early and late periods of disruption are seen with FEF TMS which may be interpreted as visual and motor disruption respectively. Such findings are inconsistent with the premotor theory of attention which posits that allocation of spatial attention is equivalent to planning but not executing a saccade (Klein 1980, Rizolatti 1994).

POSTER 140

Inhibition of Human Hippocampal Function via the 2-Back Working Memory Task

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Deactivation of medial temporal lobe (MTL) structures (and especially the hippocampal formation) has been observed during imaging studies of tasks with a heavy working memory (WM) load, (e.g., Poldrack et al., 1999; Jonides et al., 1997; Meyer-Lindenberg et al 2001; Egan et al., 2003). Here we examine the n-Back WM task, comparing the 2-Back version (requires constant updating of number sequence with the newest number and inhibition of the oldest) to the 0-Back (motor-control) version. Given the importance of MTL structures for certain types of memory, we reasoned that deactivation of MTL structures should interfere with the acquisition of information depending on MTL activation. Experiment one required participants to perform 4 blocks of n-Back and memorise and recall four different lists of 15 words after each n-Back block. There were significant deficits in verbal recall, and explicit, but not implicit, recognition between groups. Experiment two required participants to memorise face-name pairs (a task particularly sensitive to hippocampal activity: Zeineh et al. 2003), which they repeatedly viewed following similar blocks of the n-Back task. Again we found that we could induce a temporary, reversible deficit in the encoding, but not retrieval, of face-name pairs. Our results suggest this observed hippocampal deactivation persists beyond the cessation of the WM task and can alter performance on entirely separate hippocampal-dependent tasks. Furthermore it indicates that the n-Back task may induce a temporary virtual hippocampal formation lesion, which may act as a window to view cognitive processes in the absence of hippocampal involvement.

POSTER 141

A relation of polysialylated neural cell adhesion molecule expression to motor learning induced synaptic change in the cerebellar cortex.

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We have demonstrated that polysialylated neural cell adhesion molecule (NCAM PSA) immunoreactivity within the molecular layer of the cerebellar cortex exhibits a parasaggital banding pattern. This suggests neuroplasticity compartmentalisation within this structure. In order to test this hypothesis, adult male Wistar rats were trained in a motor learning task, necessitating sequential traversal of a rod followed by a suspended rope and chain. With training, animals complete the task faster and with less errors. Cerebella were taken from rats trained for 9 days to task fluency and left in cages untrained for a further 21 days, as prior studies have shown that synaptic change following this form of learning is long lasting. Systematic measurements of synaptic density were made at 25 micron increments in a mediolateral direction from near the pial surface through both NCAM PSA expressing and non-expressing compartments in Lobule IX, as this cerebellar region has been implicated in the control of balance and posture. Analysis of total numbers of synapses at each 25 micron increment reveal significant, serial oscillations in synapse density after two-way ANOVA ($p<0.001$) with a periodicity of 60-70 microns. Furthermore, a training induced increase in synaptic density is also revealed ($p<0.001$, two-way ANOVA). Intriguingly, the learning induced changes were confined to NCAM PSA negative compartments. An examination of multiple synaptic boutons also reveals a similar phasic distribution ($p = 0.0059$, two-way ANOVA) but no learning induced changes. However, and in contrast to total synapse numbers, increases in multiply innervated terminals were found in NCAM PSA positive compartments (Bonferroni post-hoc test, $p < 0.05$) suggesting subtly different forms of plasticity in NCAM PSA positive versus negative areas. All experiments were reviewed by university ethics committee.
Supported by Enterprise Ireland

POSTER 142

The role of the entorhinal cortex in perceptual learning

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It is well established that the ease with which stimuli are discriminated does not simply reflect their intrinsic similarity, but rather is influenced by prior experience (e.g., Gibson & Walk, 1956). These perceptual learning effects are evident both following discrimination training involving the target stimuli (i.e. supervised training) and following simple exposure to them (i.e., unsupervised training). Recent psychobiological models of perceptual learning (e.g., Gluck & Myers, 1993) have proposed that the hippocampal formation, in general, and entorhinal cortex (EC) in particular are involved in aspects of perceptual learning. Here we contrast the effects of excitotoxic lesions of the EC on perceptual learning effects involving supervised and unsupervised training.

POSTER 143

Long term storage of a passive avoidance task is not associated with synapse change in the secondary visual cortex .

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Explicit memories are permanently stored in distributed neocortical neural networks. Initial acquisition of memories is associated with synaptic restructuring within the hippocampus. To determine if similar remodelling underpins the stable representation of information in the neocortex, we carried out ultrastructural analyses within the secondary visual cortex at increasing times following acquisition of a passive avoidance task (PA). Previous deoxyglucose studies identified this region as being metabolically active during 120h recall of this paradigm. Input to cortical layers 1 and 4 is cortico-cortical in nature, and is the initial focus of our analyses. The synaptic complement within these layers was analysed in animals following 24h and 120h PA recall. Perfuse fixed tissue was cryoprotected and snap frozen for cryosectioning. The secondary visual cortex was excised from horizontal sections taken 3.6mm below bregma. Cytoarchitectural features were used to locate layers 1 and 4 under the electron microscope. Quantification was carried out using a standard, unbiased stereological technique, and the results compared to passive control animals. No significant change in synapse density was observed in either layer 1 (24h = 2.69±0.01 vs 2.09±0.33 and 120h = 3.33±0.37 vs 3.17±0.63) or layer 4 (24h = 2.54±0.3 vs 2.52±0.2 and 120h = 3.02±0.3 vs 3.29±0.7) in trained versus passive control animals. Moreover, no change in the relative abundance of synapse subtypes, including multiple synaptic boutons, perforated and/or partitioned synapses and multiply innervated terminals was observed in layer 1. These results suggest cortical consolidation of an avoidance paradigm is not associated with increased synapse density in layers 1 and 4 of the secondary visual cortex but do not exclude the possibility of more subtle remodelling at a molecular level. All experiments reviewed by university ethics committee.
Funded by Enterprise Ireland

POSTER 144

Analgesic effect of intrathecal injection of histogranin and noradrenalin in alleviation of neuropathic pain

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Previous experiments have demonstrated that N-methyl-D-aspartic glutamate receptor antagonists are efficacious in various chronic pain models. Implantation of adrenal medullary tissue into the spinal subarachnoid space recovers abnormal pain behaviors such as hyperalgesia and allodynia. The present experiments were conducted to identify cumulative effect of Histogranin(which has

NMDA antagonist activity) and Noradrenalin (both secreted from adrenal medulla) on pain behaviors in neuropathic rats. Chronic constriction injury (CCI) was used to induce chronic neuropathic pain. One week before CCI rats were implanted with intrathecal catheter for delivery on Histogranin or Noradrenalin or both in spinal subarachnoid space. For behavioral evaluation paw pinch, acetone and paw immersion test were used. Writhing and placing reflexes were tested for motor evaluation. Rats were tested before CCI and every other day beginning 10 days following CCI. At each test point baseline response and responses 15 min following intrathecal injection were determined. These finding indicate that induction of CCI caused responsiveness to innocuous cold stimulus and exaggerated response to noxious heat and mechanical stimuli. Injection of Histogranin or Noradrenalin reduces the abnormal pain behaviors but do not completely eliminate it. Simultaneous injection of Histogranin and Noradrenalin can further attenuate thermal and mechanical hyperalgesia and cold allodynia in neuropathic animals and may be an effective adjunct in the treatment of neuropathic pain. Supported by P/160

POSTER 145

Role of morphine on injury-induced microglial accumulation in the leech CNS: involvement of nitric oxide

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Morphine stimulates nitric oxide (NO) release in human endothelial cells and in invertebrate microglia. Damage to the leech or mammalian CNS increases NO production and causes accumulation of phagocytic microglial cells at the injury site. The aim of this study was to determine whether morphine plays a role in microglial accumulation and migration and this role is mediated by NO. Immunohistochemistry demonstrated active endothelial nitric oxide synthase (eNOS) before and throughout the period of microglial accumulation at the lesion which was more in morphine applied group than in the control group. Decreasing NO synthesis by application of nitric oxide synthase inhibitor N-nitro-L-arginine methyl ester (L-NAME) (1mM), significantly reduced microglial accumulation in morphine treated cords, whereas its inactive enantiomer N-nitro-D-arginine methyl ester (D-NAME) (1mM) resulted in microglial accumulation similar to that in crushed controls. Moreover, morphine induced accumulation of microglias was reversed by naloxone pretreatment. These results suggest that morphine may increase NO production and it may be a stop signal for microglia to accumulate there and that it can act on microglia early in their migration. Role of NO in inflammation-mediated neurodegeneration is defined. Thus, opioids may assume a larger role in nerve repair and recovery from injury by modulating accumulation of microglia, which appear to be important for axonal regeneration.

POSTER 146

Navigation decisions of rats based on a virtual spatial information: Comparison to pattern discrimination

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We examined the ability of rats to make spatial decisions in real space based on the abstract representation of this space.
We used modified Skinner box for experiment. There were four nosing holes in the pellucid front wall, situated in the corners of a 15 x 10 cm rectangle. The front wall was facing a computer monitor, serving to present visual stimuli indicating the availability of a reward in the corresponding nosing hole. Nosing holes were equipped with a photoelectric device registering the visit of the animal at the nosing hole. Two dippers were moving in a 4-cm wide gap between the front wall and the monitor. They could be raised by electric motors from the water reservoir placed below the box as a result of the animal's correct response. Then the animal could drink for 6 sec. There was a sliding barrier, which was closed as a result of incorrect choice and prevented the access to the nosing holes for 4 sec.
We compared two groups of rats: first exposed to abstract spatial stimuli consisting of rectangle and four circle contours representing the positions of nosing holes; the rewarded position was marked by bright circle; and the second group exposed to geometrical patterns without some implicit spatial information. The rats were trained in successive phases: in first phase the "map" was in real size and the stimuli marking the rewarded position overlapped with appropriate nosing hole; in the second phase the "map" was reduced and both "map" and geometrical patterns were displayed in the center of screen; in the third phase stimuli were moved to its right side.
The results of experiment showed that the group perceiving abstract spatial information was able to use it for choosing the correct nosing hole in the response space. The group with geometrical patterns was not able to solve the task, which suggested that rats with "maps" could use the spatial aspect of stimuli for navigation decisions and did not solve this task as pattern-discrimination task

POSTER 147

The effects of motivation on rates of responding: A reinforcement learning approach

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Motivational states affect both action selection and the rate (or vigor) of the chosen responses in animal conditioning. These effects have been shown to depend on neural substrates such as dopaminergic (DA) innervation of the striatum. However, in studying the computational role of DA, motivational effects on behavior rate have not been given the theoretical attention that action selection has enjoyed.
We investigated the fine temporal structure of free-operant behavior in hungry and sated rats lever-pressing for food on a variable interval reinforcement schedule. Though the probability of reinforcement increased with the time since the previous reward, the rate of lever-pressing turned out to be constant throughout the trial. Furthermore, detailed analysis showed that despite hungry rats pressing at a higher rate than sated ones, other metrics of their behavior, such as the time to consumption and the probability of going to the food magazine following a lever press, were unaffected by the rats' primary motivational state.
To understand the role of motivation from a computational perspective, we developed a reinforcement learning (RL) model of

rates of behavior. Our model is concerned not only with which actions to perform, but also with what vigor they should be performed. Given discounting of delayed rewards, indirect costs of slow behavior in terms of time lost, and direct costs of actions which increase with response rate, we show that the optimal choice of actions and vigor results directly in a constant rate of responding, as we had observed. Our framework also allows the effects of altering the general drive state of the animals to be separated from that of altering the motivational values of particular outcomes. The model thus enhances our understanding of the computational basis of motivational control from the point of view of optimality principles, and opens a wide range of possibilities in terms of modeling experimental results.

POSTER 148

Posttraining epinephrine reduce memory deficit produced by lesion in the parafascicular nucleus

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The purpose of the present experiment is to investigate whether posttraining epinephrine (EPI) can reduce the learning and memory deficit produced by bilateral lesion of parafascicular nucleus (PF). Rats were submitted to daily two-way active avoidance conditioning (30 trials per session) until achieving a learning criterion of 80% correct response in one session (maximum 14 sessions). A retention test was conducted 20 days after the last acquisition session. Ten days before training the rats received a PF bilateral lesion or a Sham lesion (acute introduction of electrode, without passing current through the electrode). After each acquisition session, i.p. 0.01 mg/kg of EPI or Vehicle was administered. Results showed that 1) PF lesion disrupted acquisition and retention; 2) EPI improved retention in the sham group and PF group; 3) EPI did not improve the process of acquisition in any of the groups. We conclude that EPI is a good treatment to facilitate retention and to reduce memory deficit, but has less effect on the process of acquisition.

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POSTER 149

Lateralization of repetition effects in event-related potentials to words in left- and right-handed women

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In our previous event-related potentials (ERPs) study, word repetition effects in right-handed males were observed only in case of the direct stimulation of the left (competent) hemisphere (Nowicka A., Szatkowska I., 2004, Neurosci. Lett. 359: 171-174). Since the left-handedness and the factor of female gender may determine the lateralization of verbal functions, the goal of the present study was to test the sensitivity of the ERPs repetition effects to the visual field of word presentation in the group of left- and right-handed women. ERPs were recorded from symmetrical sites over the left (LH) and right (RH) hemisphere. Words were presented laterally, i.e., in the left or right visual hemifield. Subjects' were instructed to recognize the test word on a response card. Substantial portion of words was repeated twice. The ERPs to new and repeated words were compared. Repetition effects were present in the late components of ERPs recorded at frontal sites. In case of right-handed females they were observed after the direct stimulation of the LH whereas in case of left-handed females - only after the direct stimulation of the RH. These findings are indicative of the influence of the handedness factor on asymmetrical involvement of the two hemispheres in memory-induced modulation of brain activity related to verbal processing.

POSTER 150

Multipolar neurons - the structural and functional foundation of vegetative sympathetic ganglia.

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A. Used-up material
-4 superior neuroganglia cervical ortosympathetic harvests from adults decease after road accidents
-3 superior neuroganglia cervical ortosympathetic harvests from newborns, for the study of neurofibres through specific method of silver impregnation Cajal- Nonidez.
B. Method of research.
Macroanatomical: disection of lateral region of the necks.
Microanatomical; the tissue were fixed in buffer formalin and in alcohol chloral-hydrate (Lillie), then were inclusion to paraffin; The visualization elements cellular matrix through histochemical method.
C. Result.
The sympathetic ganglia contain multipolar neurons which neuronal body appear ovoidal , in cluster of 3-5 neurons and realise the aspect of fish bank..
Neuroplasma of multipolar neurons contains the intense silvery granulation delivered heterogenous and variable from an pericarion to other.
Nucleus-are light color and they are placed eccentric in neuroplasma. It was observed neurons with 2-3 nucleus. To the purlieus of body cell it was are identified a conjunctive capsule described of Ramon y Cajal lining with cubical, epithelial cells called “satellite cells"(Cajal 1911) or amphicite, which have relation of contiguity with dendrites of multipolar intracapsular neurons. Satellite cells were similar with the oligodendrocite of nervous central system described from Van Doring(1955), and Rio del Hortega in 1924 and named gliocite Their function remaining unclear until today. Among the cytoplasmic organelles specifies for the nervous cells are neurofibrils. They were evidentiate through silver impregnations (Ramon y Cajal) in the likeness of of a fibrilar net in pericarion or as the bunches of the parallel fibrils in extensions, mod-

erate represented in dendrite, very numerous in big axon still more that in little axon.

To the electron microscope were evidentiate in neuroplasm the infrastructural equivalet of neurofibrils under the aspect of thin fibres (neuroprotofibrils), by variable lenght, with the 60-100A0 diameter , with an unclear role. It was considered that this organelles have a role in the development of neuronal pathway and apartain , probably, of one mechanism responsible of the guidance of nervous fibres from lenghtwise in the course of make up nervous prolongation and their regeneration. Neurotubuls are corelate directly with the mechanism of electric excitability of the proximal segment of the axon. The regular contractions ale microtubuls are changed the form and the calibre of initial segment of the axon and in consequently the penetrability membranes to this level, which will lead to the potential change of membrane.

POSTER 151

Inspection time, IQ and the worst performance rule

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The Worst Performance Rule (WPR) proposes that worst performance on reaction time (RT) and working memory (WM) tasks is the best index of IQ compared to other levels of performance (e.g. best/median/mean performance). Inspection time (IT) is theoretically closely related to these constructs but it is a simpler and more reliable measure than either. IT is also related to specific neurotransmitters and cognitive-degenerative disorders. The primary aim of the research is to appraise the WPR using IT tasks. The first study will compare four slightly different versions of a standard IT task. The results of this study should a) indicate which version of the IT task produces the 'cleanest' data, b) indicate which version best correlates with IQ [as measured by the WASI (Wechsler Abbreviated Scale of Intelligence)] and c) implicate important areas of the IT distribution for future research. In study two, the 'best' IT task will be used to test five age groups (six-, twelve-, eighteen-, thirty-five- and sixty-year-olds) who will also be tested on IQ. It will then be possible to chart the IT-IQ correlation across age. The choice of age groups is based on assumptions of neurological changes at those stages of development and these changes may express themselves in the IT plots. These data, coupled with the test of applicability of the WPR across age will yield specific hypotheses about the causes of this variation. Further studies using both EEG equipment and clinical samples could then be used to test these hypotheses and elucidate the causes (statistical, cognitive or neurological) of a) the WPR and b) individual differences in performance on tasks of IT.

POSTER 152

Self Alert Training (SAT) of Sustained Attention in Adult Attention-Deficit/Hyperactivity Disorder

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Previous research has demonstrated that sustained attention deficits can be temporarily ameliorated by the presentation of periodic auditory alerts designed to trigger increased top-down control of behaviour. In this study we developed a training protocol – Self Alert Training (SAT) - in which participants learn to produce self generated increases in alertness first in response to an auditory cue and later in response to an internally generated cue. The use of an alerting technique that is not reliant on particular environmental conditions can provide a highly flexible means of triggering controlled behaviour that is potentially applicable to a range of real-world settings. During SAT, visual feedback conveying the magnitude of each self alert event is provided via on-line changes in electrodermal activity (EDA). A group of adults with ADHD and a group of control participants were randomly assigned to the treatment condition or a video game practice control session each lasting 30 minutes. Efficacy of the treatment, relative to the control condition, is assessed via changes in reaction times and errors committed on the Sustained Attention to Response Task (SART). All participants completed four blocks of the SART prior to and following the treatment and control phases. EDA indices of alertness and performance monitoring during SART performance provided a further indication of treatment efficacy. Results are discussed in terms of the efficacy of SAT training for improving sustained attention deficits.

POSTER 153

Molecular and behavioural characterisation of male BALB/c and C57BL/6J mice

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Genetic make-up can predispose humans to stress-related diseases such as depression and post-traumatic stress disorder. In addition to changes in the neuroendocrine system, these diseases are characterised by emotional and cognitive impairments. In search for an animal model we chose two inbred mouse strains known for their different exploration patterns: C57BL/6J and BALB/c mice (Ohl et al, 2001; Meyerson et al,2004). We expected a differential regulation of the stress system together with differences in emotional behaviour. Molecular characterisation involved (i) mineralocorticoid (MR) and glucocorticoid receptor (GR) gene and protein expression in prefrontal cortex, hippocampus and amygdala and (ii) basal and novelty-induced corticosterone secretion. Behaviour was observed in the modified holeb oard and the elevated plus maze, two tasks that allow to quantify parameters for exploration, anxiety, risk assessment and arousal. Three months old male mice were used.

Results: C57BL/6J mice showed a threefold higher MR gene expression in the prefrontal cortex (PFC) compared to the BALB/c mice. Interestingly, MR mRNA expression was exclusively found in BALB/c mice in the indusium griseum, a part of the hippocampus. GR protein was increased in PFC, hippocampus and amygdala of C57BL/6J mice. Basal corticosterone was comparable, but when exposed to novelty, BALB/c mice had a faster onset and amplitude of the corticosterone responses than C57BL/6J mice. Walking patterns revealed strain-specific exploration strategies in the modified hole board and the elevated plus

maze. While C57BL/6J mice had the highest general exploration on the modified hole board, BALB/c mice showed more risk assessment in both tasks.
We demonstrated that C57BL/6J and BALB/c mice have a differentially regulated stress system in parallel with distinct behavioural patterns. Specific pharmacological modulation of MR and GR in future experiments will reveal the role of these receptors in behaviour. We expect further, that these mouse strains will be a useful tool in unravelling the impact of genetic diversity on stress-related changes in emotion and cognition

POSTER 154

The glucocorticoid antagonist mifepristone modifies steroid signaling and spatial behaviour in C57BL/6J mice

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A major characteristic of patients suffering from severe mood disorders is hypercortisolemia. Interestingly, a 7-days oral treatment with a high dose of the antiglucocorticoid mifepristone (RU38486) attenuated psychotic symptoms, improved mood and cognitive performance and normalized cortisol secretion. Mifepristone is expected to modify endocrine and behavioural responses via altered steroid signaling.
Male C57BL/6J mice (3-months-old) received one high dose of mifepristone (RU; 200 mg/kg via oats) either once (1x) or on seven days (7x). Control mice received vehicle-treated oats. An immediate effect of GR-antagonism is high circulating corticosterone for at least 8 hrs. However, 24-hrs later, basal corticosterone concentrations were significantly lower than in controls. Exposure to a circular hole board (5 min “novelty stress”), strongly augmented corticosterone secretion in 1xRU mice, while 7xRU were less responsive than controls. Novelty-induced ACTH remained low in the RU-treated groups. General locomotor activity was increased after 1xRU, whereas both RU-groups increased the latency to leave the center, dipping the head into the holes, and the number of holes visited using a serial pattern; 7xRU decreased the time spent in the rim area of the board. One week after cessation of 7xRU, hormonal responses and behaviour were still different. Interestingly, spatial learning on the circular hole board was facilitated in the multiple treatment group. Compared to controls, mineralocorticoid receptor (MR) mRNA expression was reduced by ~20% in all hippocampal subfields after 1xRU, similar in 7x RU and again lower one week after 7xRU.
Antiglucocorticoid administration has massive immediate and long-lasting effects in naive healthy mice. Neuroendocrine, cognitive and emotional responses are distinctly modulated, indicating an altered perception of the environment. The pulsatile blockade / activation of MR and GR most likely underlies the augmented circadian amplitude of corticosterone, leading to shifts in corticosteroid receptor balance and response patterns. The next step will be to verify therapeutic effects of mifepristone in an animal model with a dysregulated stress system.
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POSTER 155

Impaired Error-Monitoring and Insight in tauopathies : Evidence from Frontotemporal Dementia, Corticobasal Degeneration and Progressive Supranuclear Palsy.

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The tauopathies are a heterogeneous group of neurodegenerative disorders characterised by abnormal levels or function of the microtubule associated tau protein. Included in this family of disorders are frontotemporal dementia (FTD), corticobasal degeneration (CBD) and progressive supranuclear palsy (PSP). In this study, 70 participants underwent an extensive neuropsycholgoogical assessment. This included 12 FTD, 11 CBD and 11 PSP patients, matched controls and family members. Error-monitoring on two tasks was also measured, as was electrodermal activity responses as a function of errors. Clinical measures of insight were also administered to all participants. Results show that tauopathy patients were impaired on a number of the error-monitoring tasks and clinical measures of insight. Neuropsychological tests were also significantly associated with some of the error-monitoring and insight measures. The results of this study indicate that impaired insight is not only a feature of FTD but also of CBD and PSP. This study also helps to further clarify the critical processes that may be involved in the phenomenon of insight and the brain regions that may be compromised in patients with error-monitoring deficits.

POSTER 156

Inhibition of DHPG induced LTD in the hippocampal CA1 in vitro

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Transverse hippocampal slices (350?M) were prepared from male Wistar rats 3-4 week old. The CA3 region was sectioned and slices were placed in a recording chamber at 29-30 oC, perfused with aCSF, bubbled with 95% O2/5% CO2. The Schaffer collateral pathway was stimulated at 0.033Hz and extracellular field EPSPs were recorded in the CA1 dendritic region. RS-DHPG (100 ?M; n=11) was bath applied for 20 min, during which time the EPSP slope was reduced to 31.9 ± 4.4% of baseline. When DHPG had been washed out for 60 min the EPSP slope remained significantly depressed at 68.0 ± 4.5% of baseline ($p<0.05$). The role of phospholipase A2 inhibitors, aristolochic acid (50 ?M, n=6), bromophenacyl bromide (BPB, 50 ?M, n=7) and OBAA (10?M, n=11) on DHPG-LTD were investigated. Aristolochic, BPB and OBAA were bath applied prior to DHPG application. Aristolochic acid had no effect on DHPG-LTD (60.1 ± 6.3%) while BPB and OBAA significantly attenuated DHPG-LTD (86.9 ± 4.8% and 86.7 ± 5.8, p<

0.05) compared to baseline. The effect of inhibiting the cyclooxygenase and lipoxygenase pathways of arachidonic acid metabolism were then investigated. Application of the COX-2 inhibitor SC-236 30 min prior to DHPG at three different concentrations, of 1, 5, and 10 ?M. did not significantly reduce DHPG-LTD: 1 ?M, 71.9 ± 4.3% (n=6); 5 ?M. 63.6 ± 6.9% (n=6) and 10 ?M, 72.0 ± 8.6% (n=5). The 12-lipoxygenase inhibitor, cinnamyl-3, 4-dihydroxy-?-cyanocinnamate (CDC, 1? ?M) however when bath applied for 30 min prior to DHPG significantly inhibited DHPG-LTD (92.7 ± 6.7%, n=8, P=0.006). These results indicate that metabolites of arachidonic acid are involved in DHPG-LTD. It is unlikely that the cyclooxygenase pathway is involved; however the effect of CDC indicates that the lipoxygenase pathway is more likely to play a role in this form of depression.
Sponsored by the Irish Research Council for Science and Engineering Technology.

POSTER 157

Seizure Frequency and Cognitive performance in Nigerians with Epilepsy

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Background Information
Frequency of seizures has been associated with alteration in cognition, although the importance and impact remained largely unclear. Cognitive disturbances have contributed adversely to the educational, social, and occupational progress of epileptic patients. There has been no study done among Africans to determine the magnitude of this problem.
Objective
This study was designed to determine the effect of seizure frequency on the cognitive performances of Nigerian epileptic patients.
Methodology
A prospective study of the neuropsychologic performances of 50 newly diagnosed epileptic patients seen at the medical outpatient clinics of the University Teaching Hospital and Uselu Psychiatric Hospital, both in Benin City, using the test battery 'fepsy' comprising the Recognition Memory test, the Visual and Auditory Reaction time and Continuous performance test to assess memory, psychomotor speed and attention respectively. The cognitive performances of the epileptic of patients were compared with age, sex and level of education – matched healthy,control subjects. Results
There were 32 males and 18 females with an average age of 29.58_+13.53 years (range of 14-55 years). The cognitive performances revealed that high seizure frequency has a negative effect on the memory of patients though not statistically significant, but significantly affect the visual reaction time (f value {p<0.05}).
Conclusion
High seizure frequency has deleterious effect on the cognitive functioning of Nigerian epileptic patients, especially reaction time and memory. The possible mechanisms by which this occurs and the implications of this finding on the quality of life of these patients were discussed.

POSTER 158

Transcriptional regulation following passive avoidance learning

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The consensus view is that a learning event initiates a cascade of molecular signals, which culminates in alterations in gene activity. These, in turn, mediate synaptic remodeling, in particular within the hippocampus, a structure vital to memory formation. The molecular underpinnings of these morphological events are still poorly understood. To address this issue we probed DNA microarrays with mRNA isolated from the rat dentate gyrus at increasing times following passive avoidance learning. We used a 2-fold change criterion and found that approximately 360 genes were transcriptionally regulated across the 24h post-training period. These genes were then clustered both functionally and temporally to reveal key periods of molecular regulation. Several trends in expression become obvious such as the early up-regulation of genes involved in transcriptional / translational control, these make up ~30% of the genes up regulated at 0 and 2h. Similarly, genes involved in restructuring make up a large percentage of genes up regulated from 0-3h, consistent with the structural rearrangements seen at this time. The most striking feature however, is the profound down regulation, across all functional groups, at the 12h time point, with almost half (48%) of genes modulating at any time point decreased at this time. We validated the transcriptional regulation of 4 genes, low-density lipoprotein receptor-related protein (LRP3), alpha-actin, synaptosomal-associated protein 25 kDa (SNAP25) and N-ethylmaleimide sensitive factor (NSF) using real-time PCR. In addition, we found that Lrp3, SNAP25 and NSF show corresponding changes at the protein level. This study provides evidence that memory consolidation may require a period of quiescence at the synapses to allow the process of synaptic selection to proceed.

POSTER 159

Neural correlates of deductive inference: A language-independent distributed network

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Studies to identify the brain areas supporting deduction show inconsistent results, possibly because of inadequate baseline controls for language. To dissociate the brain bases for deduction from those for language, we compared complex deductions to simpler ones with identical linguistic complexity. In a single trial functional magnetic resonance imaging paradigm, healthy adults evaluated visually presented arguments for validity. Arguments varied on logical status (valid versus invalid) and lexical content (abstract versus

concrete). Subtraction of simple from complex arguments revealed a network of activations possibly organized into two main functional groups. Regions in left anterior prefrontal cortex, along with bilateral medial prefrontal cortex may embody operations essential to deduction (possibly with the support of right posterior cerebellum). Regions in bilateral dorsolateral, bilateral inferior frontal, left parietal and insular cortex appear instead to provide support in extracting and maintaining the logical form of arguments. Restricting the complex-simple subtraction to either concrete or abstract contents revealed additional areas selectively engaged by each. Regions in left inferior frontal, middle frontal and medial frontal cortices appear to be implicated in maintaining abstract information.
Similarly, areas in left occipital, right posterior parietal and bilateral cingulate cortices are implicated in maintaining concrete content. There was activity for invalid deductions beyond that for valid ones, only for concrete content, in right dorsolateral frontal cortex. These results suggest that deductive inference relies on a language independent network engaging content-independent (core and support) areas for deductive operations along with content-specific (support) areas maintaining semantic information.

POSTER 160

Sensory substitution and balance

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Sensory information is known to play an unparalleled part in the control of upright undisturbed stance. The reduced motions of the body must be indeed detected throughout numerous receptors originating from the vestibular, proprioceptive, tactile and visual systems. However, when one of these cues becomes impaired (transitorily or permanently), some reorganisation of the control process can be observed at the central nervous system level. Along these lines, the pioneering techniques consisting to substitute one of these cues throughout the remaining systems constitutes a real and promising line of investigation.
These feedback techniques have in common to allow the subjects to get spatio-temporal information from various origins through another sensory canal. In the present study, our aim was to compare several feedback techniques including visual, auditive, and tactile (through a monitor screen, a sound device and the tongue display unit, respectively) in both healthy and impaired (blind) individuals. The information given was relative to the centre-of-pressure displacements (indicative of the body motions) measured through a force platform on which the subjects stand. It visual feedback is a well documented technique in both healthy and disabled subjects, the effects induced by furnishing additional information through tactile and auditory systems remained to be explored.

POSTER 161

The effect of task-irrelevant visual information on the memory of haptic scenes

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Does task-irrelevant visual information improve our memory for tactile scenes? We investigated the effects of noninformative vision on haptic memory of layouts of objects arranged in a scene. Using touch alone, participants first learned a scene and were subsequently tested on their recognition of that scene. Participants could either see the surrounding room or were blindfolded. We predicted better recognition when the participants could see the task-irrelevant visual information.
In Experiment 1 we found that noninformative vision improved haptic scene recognition. Moreover, this benefit transferred to the subsequent condition where the participant was blindfolded. In Experiments 2 and 3 we investigated whether wearing a blindfold reduced performance but we found no evidence of this. In Experiment 4 we investigated whether the benefit for noninformative vision again transferred to the blindfolded condition. Here, however, the participant moved to a new environment for the blindfold condition. Unlike Experiment 1, we found no transfer of the effect of noninformative vision on haptic scene recognition performance. Our results suggest that vision provides the reference frame to which haptic scenes are encoded. Noninformative vision enhances recognition performance for haptic scenes provided that the same visual information is available throughout the task.

POSTER 162

Characteristics of place cell firing in an environment requiring path integration

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Place cells in the rat hippocampus commonly show place-related firing activity in the animal's current environment. The location of place fields can be controlled by external sensory inputs available in the environment. However, place cells can maintain stable place fields even in the absence of reliable environmental cues, suggesting that they are also influenced by movement-related information (path integration). In this study, we evaluated the capability of the place cell system to maintain a stable spatial representation when the animal explores a complex environment where visual and tactile information is not always available. Place cell activity was first recorded while rats explored a cylinder divided in 3 identical compartments except for one compartment that contained visual and tactile cues. The animals could freely move between the 3 compartments, but, when in a given compartment, could not perceive the environmental cues present in the other two compartments. Most cells had distinctive firing fields in each compartment, even in the two identical non cued compartments. To rule out the influence of non-controlled cues, a rotation of the cylinder (120°) was done. Cylinder rotation resulted in equivalent field rotation for all

cells. These results suggest that, while rats explore a complex environment, the place cell system is able to form a spatial representation for each compartment based on a combination of path integration and environmental cues provided by the distant (different) compartment, which are used to recalibrate the rat's position.

POSTER 163

Error-related negativity elicited by subliminal visual stimuli

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Subliminal perception is said to occur whenever stimuli presented below the threshold of awareness are found to influence thoughts, feelings, or actions. Here we provide electrophysiological evidence of subliminal perception by recording an event related potential (ERP) component: the so-called Error-Related Negativity (ERN). This is a large negative polarity peak in the ERP waveform that occurs when subjects make errors. A number of studies have suggested that the ERN reflects the activity of a brain system that detects and corrects for errors. In the present study healthy participants performed in a forced-choice task paradigm: They responded to black and white checkerboards (2.5°x2.5°) displayed at 5° from fixation. The stimuli were either presented unilaterally (to the left or to the right of fixation) at the maximum luminance or bilaterally with one stimulus (randomly chosen) displayed at the maximum luminance and the other displayed at one of three levels of luminance in the range of the psychophysical threshold. The subjects were required to make a differential key press according to whether they saw one or two stimuli. Following the manual response, on each trial, participants reported on a commentary key how certain they were about the correctness of their response. The use of the commentary key enabled us to compare error trials when the subject was aware of the error vs. when he/she was unaware of his/her incorrect response. As expected, when subjects made errors there was a larger ERN (recorded at the Fz and Cz electrode sites) than when they correctly responded to the stimuli. The main thrust of the experiment, however, was that an ERN was present also when comparing correct and incorrect responses to subliminal stimuli that went consciously unperceived and the subjects were confident they had not been presented.

POSTER 164

Blinded by fear: anxiety and the time course of attention to fearful faces in the attentional blink

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Selective attention involves the differential processing of different stimuli, and has widespread psychological and neural consequences. Attentional mechanisms act to prioritise information on the basis of both "bottom-up" stimulus saliency (e.g. big, bright objects) and via "top down" control mechanisms that prioritise items on the basis of behavioural relevance. Conspecific fear expressions convey important information about potential environmental threats, and as a result may be particularly important for us to prioritise.
The attentional blink (AB) paradigm is thought to measure the time course of attention to a particular target. In the AB, participants are requested to report the identity of 2 targets that are presented within a stream of distractors. Performance on the 2nd target (T2) is markedly impaired if it appears within 500ms of the 1st (T1). In the current study we used neutral, happy and fearful T1 faces and examined subsequent performance (gender decision) on a neutral T2 face appearing a series of SOAs to T1, to examine differential effects of emotion expressions on attention. Within the group of participants as a whole, we found the usual recovery of T2 performance as the SOA between T1 & T2 increased, but no effect of T1 expression and no T1 expression by SOA interaction. Splitting the sample into low and high state-anxious groups, however, revealed an interaction between state anxiety and T1 expression on T2 performance. Further analyses suggest that in high anxious individuals the presence of a fearful T1 expression is more detrimental to T2 performance than the presence of a neutral T1 expression, with the converse pattern observed in low anxious individuals. These data are consistent with the notion that fear-relevant stimuli are stronger competitors for attention in anxious individuals.

POSTER 165

Extinction of conditioned fear memory to a context is related to anxiety levels

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Individual differences in anxiety-related behaviour are systematically observed in a normal population. The interaction between genetic and epigenetic factors is likely contributing to this interindividual variation in anxious behaviour by affecting the activation of neural circuits and the adoption of a certain coping style. Previous studies in humans showed that trait anxiety can influence the sensibility to threatening contexts and to the establishment of associative learning, such as classical fear conditioning. The aim of this study was to examine, whether, in rats, anxiety levels are related to establishment and extinction of a contextual fear conditioning memory. For this purpose, 60 male Wistar rats were ranked in terms of their anxiety-like behaviour in the elevated-plus maze, as defined by the time they spent in the open arms of the maze. Of these, we selected sixteen animals with extreme differences in terms of their anxiety, eight with the highest levels (HA) and eight with lowest levels (LA). One week later, they were trained in a contextual fear conditioning (0.4mA shock intensity). HA and LA rats showed similar freezing levels in the post-shock period at training and in a subsequent test performed 24 hours after training. However, one week later, when animals were submitted to the extinction sessions, HA rats showed a reduced extinction rate compare to LA. In conclusion, anxiety levels are related to the extinction of contextual fear conditioning.

POSTER 166

The effect of overexposure to context on context conditioning.

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The aim of this experiment was to test the effect of a long exposure to the conditioning context prior to context conditioning. Male SD rats were exposed to the conditioning box before a single context conditioning trial either for 5 minutes or for the whole night (ON group). Rats in the ON group showed a significantly lower level of freezing on a subsequent test trial than those that were exposed for only 5 minutes.
Two further groups of rats received similar overnight exposure to the context before conditioning, but a temporal gap of five minutes (ON-5 minutes) or one hour (ON-1H) in a different (but familiar) context was introduced between overnight exposure and the conditioning trial. The ON-5 minutes group actually showed enhanced freezing on test, while the ON-1H group showed a similar level of freezing as animals exposed to the context for only 5 minutes before their conditioning trial. The results are discussed in terms of a clear differentiation between the effects of overnight exposure to the context and the latent inhibition effect.

POSTER 167

Conditioned release of corticosterone by conditioned stimuli associated with addictive drugs

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A variety of addictive substances such as cocaine, amphetamine, morphine and nicotine increase the release of corticosterone (CORT) in rats. The purpose of these studies was to determine whether such endocrine effects could be conditioned to drug associated stimuli. Drug-induced conditioning was achieved using a simple contextual design in which rats (PAIRED) injected with either of these four drugs were exposed to a unique environment (Plexiglass chamber scented with peppermint) for 30 min, and then injected with saline one hour following return to their home cages. UNPAIRED rats were injected with saline prior to exposure to the conditioning chamber and with the various drugs in their home cages, while the CONTROL group rats received saline in both environments. Following seven consecutive days of treatment all rats were returned to the conditioning chamber on day 8 for 30 min prior to collection of blood samples. Blood CORT concentrations in the PAIRED group were significantly higher than in the UNPAIRED and CONTROL groups after cocaine and amphetamine but not after nicotine or morphine. The lack of conditioned effects for the latter two drugs is apparently due to the rapid development of tolerance to their CORT releasing properties. In a separate series of studies it was found that animals exposed for 25 min to contextual cues associated with either cocaine or amphetamine, as above , also exhibited increases in anxiogenic-like behavior compared to the control groups as assessed in the elevated plus-maze, demonstrating a behavioral correlate to the conditioned increases in CORT. Preteatment of rats with i.c.v. injections of the CRF antagonist, alpha-helical CRF 9-41 on the test day prior to exposure to cocaine or amphetamine associated cues attenuated the subsequent increases in CORT release as well as the anxiogenic-like behavioral response. These data illustrate that steroid hormonal responses of sympathomimetic drugs such as cocaine and amphetamine can be conditioned to drug-associated cues and that such effects are mediated by endogenous brain CRF. (Supported by NIH)

POSTER 168

Lesions of the thalamic reticular nucleus of rats do not impair performance in a test of divided attention.

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Previous studies from this laboratory have indicated that lesions of the thalamic reticular nucleus (TRN) result in impaired covert orienting of spatial attention (Weese, Phillips & Brown, 1999; J Neurosci). The purpose of the present study was to investigate the effect of lesions of the visual and auditory sectors of TRN on a test of non-spatial divided attention. Rats were trained to maintain a nose-poke for a brief duration prior to the presentation of a stimulus. Bright lights bilaterally in the response holes indicated a right response would be rewarded, while bilateral dim lights indicated a left response. The same rats were then trained to respond to the left when they heard a pulsing tone and to the right if the tone were continuous. For testing, rats received blocks of either visual stimuli or auditory stimuli (unimodal condition), or the modality of the stimuli was unpredictable from trial to trial (bimodal condition). Reaction times to stimuli were faster during unimodal blocks compared to bimodal blocks. This reaction time difference is assumed to reflect the cost of dividing attention between the two modalities. Lesions of the visual and auditory sectors of the TRN were made bilaterally with ibotenic acid (0.05M; -3.7mm AP, +/-3.4mm ML, -5.4mm DV). After surgery, lesioned animals demonstrated a small increase in incorrect and late responses. However, no interaction was found in reaction times between surgical group and condition (unimodal vs bimodal), suggesting that TRN lesions do not alter the ability to divide non-spatial attention between two modalities. These data are particularly interesting as they suggest that, despite strong evidence demonstrating a role for the TRN in some attentional processes, the TRN may not be involved so strongly in mechanisms that underlie division of non-spatial attentive processes. This further indicates that attention is a multi-faceted psychological construct, the neural basis of which may differ among its different expressions.

POSTER 169

Impact of intermittent exposure to individual housing and wheel running on behaviour and neurotrophin levels in mice.

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In this study we investigated how mice living socially in an enriched environment compared to mice living in a standard social condition respond to intermittent wheel running and individual housing. The mice were assessed for their running activity, locomotor and exploratory behaviour in the open-field and in an automated behaviour analysis system. Brain neurotrophins were determined in selected brain regions. Female BALB/c mice group housed in enriched and standard conditions were subsequently divided into 6 groups. Two groups were exposed on alternate days to individual running wheel cages, two groups were alternately housed in individual cages but with no running wheels, and two control groups remained in their respective home cages of enriched or standard conditions. No significant differences in alternate days wheel running activity between enriched and standard group housed mice were found. In the open-field test, mice exposed to individual housing without running wheel were significantly more active than wheel running and group housed control mice. Intermittent individual housing increased behavioural activity and reduced nerve growth factor (NGF) and brain-derived neurotrophic factor (BDNF) levels in frontal cortex; while it increased BDNF level in the amygdala and BDNF protein and mRNA in hippocampus. Besides normalizing motor activity and regulating BDNF and NGF levels in hippocampus, amygdala and cerebellum, physical exercise did not attenuate reduction of cortical NGF and BDNF induced by intermittent individual housing. Thus intermittent withdrawal of social contact in the form of individual housing has more impact on the animals than the other commodities. Interestingly, wheel running can normalize some of the effects of individual housing in mice. Our results also suggest that some changes in neurotrophin levels induced by intermittent individual housing are not similar to those caused by continuous individual housing.
This study was supported by funds from the Swedish Research Council and the Swedish Alzheimer's Foundation

POSTER 170

Complex behavioral changes induced by partial bilateral mesencephalic lesion

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Planning refers to the volitional organization of behaviour for attaining a specific goal and requires different key processes: motivation, cognitive function like memory, attention or intention and motor function. These processes are known to be modulated by dopamine. Dopaminergic neurons are divided into two major subsets: the ventral tegmental area (VTA) innervating the frontal cortex, the ventral striatum and the hippocampal formation and the substantia nigra pars compacta (SNc) that projects to the caudate nucleus and putamen. We hypothesized that different aspects of action could be identified with regard to distinct dopaminergic pathways. Here, the relative effects of restricted partial bilateral lesion of SNc (65 % decrease in stereological number of TH-IR neurons) or VTA (decrease 25 % of TH-IR neurons) on motor, motivational and cognitive behaviour are investigated. Motor impairments were estimated by the measure of fine motor control in the stepping test and in the paw reaching test. Cognitive functions was assessed by different paradigms: spontaneous alternation in Y maze and object exploration task. Appetitive behaviour was evaluated by the 100 pellets test and the paw reaching test. The study suggests that specific behavioural impairments are obtained following selective lesions of either of SNc and VTA. Rats with SNc lesions presented deficits in motor functions as described in Parkinson's disease model, whereas rats with VTA lesions were disrupted in their action planning without motor impairments.
The University Victor Segalen, the CNRS and the IFR (INSERM N°8; CNRS N°13) funded this study.

POSTER 171

Temporal characterisation of the effect of anterior thalamic nuclei lesions on immediate-early gene activation in retrosplenial cortex in the rat.

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Interest in understanding the function of the retrosplenial cortex (RSC) has recently accrued. There is now widespread evidence of RSC dysregulation in disorders that involve memory impairment, such as Alzheimer's Disease, vascular dementia, and epilepsy. Recent evidence from our laboratory has revealed a striking vulnerability of granular RSC to anterior thalamic nuclei (ATN) lesions, as evidenced by hypo-immunoreactivity of the immediate-early genes (IEGs) Fos and Zif268. This is of particular interest as in Alzheimer's Disease the ATN show some of the earliest and most profound pathology. Meanwhile, the RSC may be the first region to exhibit metabolic abnormalities, while remaining structurally intact.
We sought to characterise the temporal nature of the effect of ATN lesions on RSC function. Here, we describe the analysis of IEG activation 1, 2, 4, or 8 weeks post unilateral ATN lesions. On the final day, animals were placed for 20 min in a novel cage in a novel room, returned to their home cage, and brains were obtained 90 min after the onset of this manipulation.
Inspection of the RSC revealed a lower IEG levels on the lesion side at all time points. IEG levels increased across time, a significant rise being observed from week 1 to 2 but not 2 to 8 as numbers appeared to stabilize. Analysis of an interaction between protein and surgical treatment revealed that whereas Fos levels were greater than Zif268 in the non-lesion group, the reverse was found in the lesion group. Next, analysis of the protein by time point interaction revealed that levels of the 2 proteins increased differently, Fos first quickly then less steeply, opposite to the pattern exhibited by Zif268.
This temporal characterisation of RSC function after ATN disturbance suggests a protracted "recovery" period, which is unequal for the IEGs studied. Our results provide additional data to further the understanding of the relationship between the ATN and the RSC.

POSTER 172

Impaired Performance Of Heavy Marijuana Users On A Decision-Making Task: An Fmri Study

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The majority of studies examining the consequences of long-term marijuana use on brain function have focused on aspects of memory and related cognitive processes. In contrast few studies have examined performance on other types of tasks, particularly those involving judgment and decision-making ability. A number of recent studies have shown that chronic exposure to abused substances such as pscyhostimulants, opiates and alcohol produces impairments on decision-making task performance. The purpose of this study was to determine if chronic marijuana users would also display dysfunctional decision-making and if deficits would be reflected in patterns of neural activation. We conducted an fMRI study using the Iowa Gambling Task (Bechara et al., Cognition, 1994; 50:7-15) as adapted for use in the scanner. The gambling task measures the ability to balance immediate rewards against future negative consequences. Seventeen heavy users (individuals who had smoked marijuana daily for at least 5 years) were compared to control subjects (individuals who had smoked marijuana no more than 50 times in their lives). Users performed more poorly than controls (mean ± SEM; net score -25.1 ± 7, vs.18.6 ± 7) on the task. Users and controls displayed similar patterns of task-related activation. However, users displayed a strong deactivation in the anterior cingulate cortex during Gambling Task performance. Activation in this region was positively correlated to gambling scores of users and controls. These results show that chronic marijuana use is associated with impaired decision-making and that this is reflected in a failure to activate the anterior cingulate cortex. This implies that heavy marijuana use may be associated with a more general deficit in the processing of information related to conflicting outcomes.

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POSTER 173

Differential contribution of the parafascicular nucleus in implicit and explicit memory tasks.

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The parafascicular (PF) is a posterior intralaminar nucleus of the thalamus classified as a component of the ascending reticulo-thalamo-cortical activating system and is involved in cognitive processes such as learning, memory and attention. The PF receives inputs from brainstem nuclei, the basal ganglia complex and both motor and premotor cortices, and projects to specific parts of the striatum and cerebral cortex, particularly prelimbic regions. The specific role played by multimodal information encoded in PF neurons is still unclear. We conducted two experiments to investigate the role of the PF in different learning tasks: the social transmission of food preferences (STFP, Experiment I) and the two-way active avoidance conditioning (2AA, Experiment II). The STFP is a social memory task that uses olfactory cues and exhibits some of the characteristics of relational memory because it requires that rats use information obtained in one episode to guide later behavior in different circumstances; in contrast the 2AA task is considered to measure implicit memory and relies on both classical fear conditioning and instrumental aversive conditioning. The behavioral effects of pretraining bilateral NMDA lesions of PF were compared to vehicle and sham operated controls in both experiments. In the experiment I, rats were tested on their ability to remember the association either immediately (short-term memory) or after a 24 hr delay (long-term memory). Our findings provide evidence that the lesion of PF critically affects both STFP tests, and supports the role of this nucleus in this non-spatial form of relational memory. In the Experiment II, rats were trained in a single 30-trial acquisition session of 2AA conditioning and tested again 24 hours after (retention session). In general, the effect of PF lesions on 2AA conditioning seems less pronounced than the effect observed on the STFP learning task. Present studies suggest a differential contribution of the PF in implicit and explicit memory processes, which is discussed in the context of prefrontal cortex and striatal deafferentation induced by PF damage.

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POSTER 174

Locomotor activity is a predictive test after global isquemia-reperfusion on mongolian gerbil

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INTRODUCTION:The Mongolian Gerbil is one fo the main species of animals used for the study of global isquemia,due to their specific Willi's circle.Their anatomic variety makes it necessary to use a large number of animals.Because of the specific vulnerability of the hippocampus,striatum and layers II,IV,VI of neocortex,it is possible to evaluate the severity of the isquemic damage through analysis of locomotive activity.METHODS:The locomotive pattern of 30 male mongolian gerbils was recorded before they were subjected to bilateral carotid clipping for 15 minutes under anesthesia with enfluorane,followed by reperfusion.For the pourpose,a transparent 75x50x90cm acrylic box was filmed through a television closed circuit in order to determine the total distance covered in five minutes,for three consecutive days.The locomotive activity of the animals was analized too,in open field 24 hours,and seven days after isquemia.Serum detection of neuron-specific enolase (NSE) was performed in both isquemic and normal control groups.RESULTS:The records for normal animals were homogeneus (average 200 squares) in the first trial (188+/- 6.7 standar deviation).After the isquemia the numbers increased to 388 squares in 71% of the animals (average 388+/- 40 standar deviation) indicating that they were sensitive to the isquemic episode.Seven days later they returned to their basal numbers.Serum levels of NSE significantly increased

in the isquemic group (P<.001).CONCLUSIONS:Locomotive activity in open filed is a reference useful as a predictive test to determine sensibility of experimental animals to isquemia.It is also associated to the degree of cerebral damage in global isquemia-reperfusion for 15 minutes,as a clinical expression of injury.

POSTER 175

Effects of nicotine on novelty seeking in adolescent and adult male mice

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Novelty seeking has been proposed as a factor implicated in the initiation and maintenance of tobacco consumption in adolescence. Although differential sensitivity to the effects of nicotine between adolescent and adult rodents has been reported in different behavioral tests, no studies in adolescent mice have been performed using the hole-board test. The present study was undertaken to systematically evaluate effects of nicotine in this paradigm, which measures exploration and novelty seeking both in adolescent and adult mice. The hole-board test has also been used to evaluate anxiolytic and anxiogenic effects of drugs. The apparatus consisted of a board with 16 equidistant holes. Experimental subjects were adolescent (34-35 days of age) and adult (<60 days of age) male NMRI mice, which were tested in the hole-board 15 min after the administration of nicotine (0.25, 0.5 or 1 mg/kg, as base) or saline. The test lasted 5 min and measures obtained were: total number of "head-dips" (number of holes visited), latency to the first "head-dip", grooming and rearing. Results indicated that adolescents displayed shorter latencies to the first head-dip than adults ($p<0.001$). In adult mice, nicotine (1 mg/kg) decreased the total number of head-dips ($p<0.001$) and rearing behavior ($p<0.02$). In adolescent mice, nicotine (1 mg/kg) also diminished rearing ($p<0.01$) but had no significant effects on total number of head-dips or latency to the first head-dip. These results would suggest that adolescent mice show elevated levels of novelty seeking in the hole-board test and that there exists a differential sensitivity to the acute administration of nicotine between adolescent and adult mice, confirming previous studies in other behavioral paradigms.
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POSTER 176

Minimal change to rodent housing affects behaviour and brain structure.

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Rodents housed in complex environments exhibit improved learning and greater brain complexity. The influence of subtle change to animal housing, however, remains to be established. To address this issue, we housed groups of 15 F1 Wistar offspring in basic (large, wire-bottomed cage) and supplemented (cardboard tube and an accessible, smaller cage with bedding) environments from weaning. On postnatal day 80, animals were housed individually either in basic cages with wire floor and high opaque walls or supplemented cages with woodchip-bedded hard bottoms and low opaque walls allowing visual contact. Animals were observed in an open-field arena on days 1-2. The animals were divided into groups for ultrastructural studies and training in a single session,
5-trial water maze paradigm on day 3. Compared to animals reared in basic conditions, those maintained in the supplemented environment exhibited increased exploratory behaviour, improved performance in the
water maze, and ~50% increase in synaptic density in the hippocampal dentate gyrus of naive animals. These studies demonstrate modest change to the environment results in a more complex neural structure and more efficient behavioural responses.
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POSTER 177

The domestic chick and the line-bisection task

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In a recent study of ours (Diekamp et al., Curr. Biol., 2005) domestic chicks and pigeons were required to freely peck at food grains scattered anywhere on a given surface. Both species showed to select targets with a considerable leftward bias, uniformly spread across the bird's left hemispace. We continued this line of research by investigating Gallus gallus chicks' performance in a one-dimensional space: chicks were required to peck, for food reinforcement, at the central element in a horizontal line made of identical elements (beads). This task is an adapted version of the so called line-bisection task, where humans show a significant leftward bisection error ("pseudoneglect"), ascribed to a right hemisphere dominance. In Exp. 1 binocular chicks (N=55) were tested with lines of different length (by varying either the spacing between the beads or the number of beads in the line). Chicks showed in all conditions a consistent bias to peck at the left of the actual midline. In Exp. 2 we tried to better understand the nature of this bias by testing a new group of chicks (N=40) in monocular conditions of vision. Left-eyed chicks were better with the simpler 3-bead lines than right-eyed chicks, although in generalizations to 9-bead lines left-eyed chicks (not right-eyed ones) tended to shift from a leftward to a rightward bias. In Exp. 3, to clarify these results, binocular and monocular chicks (N=60) were tested in a simplified task involving training directly on the 9-bead line and no generalization. Both monocular groups behaved similarly, each showing a lateral bias consistent with the condition of vision, while binocular chicks showed, in this seemingly easier task, a trend to confirm the results of Exp. 1. The two eye systems seem to be differently involved in this task, and binocular chicks' behaviour is more comparable to that of left-eyed (right hemisphere) than right-eyed (left hemisphere) chicks.

POSTER 178

Interaction between proximal objects and distal cues in controlling hippocampal place cell activity.

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Studies in rodents indicate that distal and proximal cues provide important and complementary information for guiding navigation. Shapiro et al. (1997) suggested that hippocampal place cell firing is controlled by both distal and proximal cues in a flexible and hierarchical fashion: 1) Control exerted by the relationship between the two sets of cues prevails over the control by distal cues which prevails over the control by proximal cues, 2) Cells primarily controlled by distal cues are able to switch to proximal cues when distal cues are made irrelevant. We examined the possibility that such flexibility and hierarchy may be different in a task and for cues differing from those used by Shapiro et al. In the present study, rats performed a pellet chasing task on a circular platform containing 3 objects (proximal cues). The apparatus was surrounded by curtains where 3 distinct patterns (distal cues) were hooked. After identification of the place field in a standard session, a double rotation, i.e. 90° rotation in opposite directions, was applied to the distal and proximal cue sets therefore altering their spatial relationships. This produced a reorganization of the representation (remapping) in a majority of cells suggesting a control by the whole cue configuration. Less often, cells were controlled by proximal cues only, and yet more rarely, by distal cues only. This suggests that the relative importance of proximal and distal cues in controlling place cell firing may vary according to the task and therefore to the spatial strategies used by the animals. Furthermore, a number of additional tests involving removal of a specific set of cues revealed some limitations in the flexible use of distal and proximal cues.

Shapiro ML, Tanila H, Eichenbaum H (1997) Cues that hippocampal place cells encode: dynamic and hierarchical representation of local and distal stimuli. Hippocampus 7:624-642.

POSTER 179

Strain-specific enhancement of olfactory discrimination learning and spine density along hippocampal neurons following 5-Hydroxytryptamine4 receptors activation

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The 5HT4 receptor (5HT4R) is a G protein-coupled serotonin receptor widely expressed in the brain and recently shown to be involved in the modulation of learning and memory. At the cellular level, 5HT4R activation induces long-term-blockade of K+ channels increasing cell excitability and promoting synaptic plasticity. To further study the promnesic effect of compounds acting at 5HT4R, we injected SL65.0155, a partial 5HT4R agonist, in C57BL/6J(BL6) and DBA/2J (DBA) inbred mice that show a natural variability in the degree of hippocampal functionality and different levels of performance in hippocampal-dependent tasks. After preliminary study on the effects of SL65.0155 on locomotion and anxiety, mice from both strains were trained for 6 days in the automated tubing maze to discriminate between two simultaneously presented odors with one odor being paired to a liquid reward. In addition to the behavioral experiments, we controlled whether any promnesic effect consecutive to SL65.0155 injections was accompanied by changes in the morphology of hippocampal neurons. Saline-injected BL6 mice readily learned to discriminate between simultaneously presented olfactory cues and showed a strong increase in spine density along apical and basal dendrites of hippocampal CA1 neurons following training. Interestingly, in that strain, 5HT4R activation promoted an additional increase in both learning performance and dendritic spine density. Conversely, saline-injected DBA mice failed to show any significant discrimination learning and post-training change in dendritic spine density, and 5HT4R activation did not affect either the learning performance or the neuronal morphology. These data indicate that stimulation of 5HT4R enhances memory and dendritic spine density along hippocampal neurons in mice that already show a functional hippocampus but did not in mice with a genetic hippocampal dysfunction.

POSTER 180

The involvement of cerebral cholinergic receptors on morphine-induced amnesia in morphine-sensitized mice

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Morphine exert amnestic effects in different models of memory. Choronic administration of morphine induces long-lasting changes in Acetylcholine (Ach) release in the nucleus accumbens, which may be involved in behavioral sensitization. In the present study, the effects of intracerebroventricular (i.c.v.) injections of cholinergic agents on morphine-induced amnesia in morphine-sensitized mice were investigated. In these experiments, Male albino mice weighting 22-30 g at the time of surgery were used. Animals were canulated in right lateral cerebral ventricle by stereotaxic instrument. Our data showed that the pre-training injection of 5 mg/kg of morphine impaired memory in a step-down passive avoidance task. Amnesia induced by pre-training morphine was significantly reversed in morphine-sensitized mice, which had previously received once daily injections of morphine (20 and 30 mg/kg, s.c.) for 3 days. Three daily injections of physostigmine (1, 3 and 5 mg/mouse, i.c.v.) or atropine (1, 4 and 7 mg/mouse, i.c.v.) during morphine-sensitization, decreased and increased the amnesia induced by pre-training morphine respectively. Three daily injections of nicotine (0.75, 1 and 2 mg/mouse, i.c.v.) or mecamylamine (1, 3 and 6 mg/mouse, i.c.v.) before morphine, also decreased and increased the amnesia induced by pre-training morphine respectively. The results suggest that morphine sensitization affects the impairment of memory formation and thus it is postulated that central cholinergic systems may play an important role in this effect.

POSTER 181

Lesions of rat infralimbic medial prefrontal cortex enhance renewal of extinguished appetitive Pavlovian responding.

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Extinction of Pavlovian conditioning is characterized behaviourally by a decline in conditioned responding (CR) to a conditioned stimulus (CS) that once signalled the occurrence of reinforcement (the unconditioned stimulus, or US) but no longer does. It is well established that extinction is highly context dependent (Bouton, 1994) and several behavioural phenomena associated with the expression of extinction (spontaneous recovery, reinstatement and renewal) have been described as resulting from a change of context. It has previously been shown that lesions of the infralimbic (IL) region of the medial prefrontal cortex (MPFC) result in increased levels of spontaneous recovery and reinstatement of an extinguished Pavlovian CR (Quirk, Russo, Barron, & Lebron, 2000; Rhodes & Killcross, 2004). The current study found that lesions of the IL MPFC resulted in increased renewal of a CR when tested in the acquisition context. 13 IL-lesioned and 14 Sham-lesioned rats were trained on an appetitive Pavlovian task in one context (Context A), followed by extinction in a different context (Context B); animals were then tested (under extinction in a counterbalanced order) for renewal of responding in both Contexts A and B. Both groups demonstrated similarly low levels of responding when tested in the extinction context (B), and greater responding (i.e. renewal) when tested in the acquisition context (A). However, the level of renewal was greater in IL-lesioned animals. The results are discussed in relation to the possible role of the IL MPFC in contextual control of extinction.

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POSTER 182

Does knowledge of associative links produce a typical semantic priming effect?

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It is commonly believed that representations of concepts and their relationships in semantic memory are based on shared features such as category membership or functionality. Priming studies have shown that the presentation of a word leads to facilitated recognition of words that are semantically related, thought to reflect automatic activation from the presented word to the representations of neighbours within a network. Feature overlap (i.e. category/functional relationship) is not typically distinguished from associations we make between words, where one word calls to mind another. Associative links have generally been disregarded as a possible influence on priming, or are confounded with feature overlap. In two experiments we investigated the influence of association on unconscious activations using a priming paradigm, independently manipulating association and feature overlap. Participants (N30 in both) were presented with a prime word (150ms presentation) followed by a target word to which they made a lexical decision. In experiment 1, participants were presented with prime-targets related by association (elastic-band), association and feature overlap (lemon-orange), feature overlap (cereal-bread) or that were unrelated (stereo-thumb). Similar priming effects, as reflected by reduced reaction times, were found for all three types of related pairs. In a second experiment we examined the influence of association strength on priming. Participants were presented with prime-targets that shared a strong association (elastic-band), weak association (grave-digger), and those that were unrelated (stereo-thumb). Both strongly and weakly related pairs produced similar priming effects. Our results suggest that knowledge of associative links can lead to unconscious automatic activations from a word to other words in the lexicon. Furthermore, activations to related words based on association occur independently of the strength of association between prime and target.

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POSTER 183

Effects of gaze contrast polarity on joint attention behaviours

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Adults are highly inaccurate in judging gaze direction when the contrast polarity of eyes changes from positive to negative polarity, but they also have a tendency to imitate another individual's direction of gaze. Recently, gaze imitative behavior has been linked to the ability to establish and maintain states of shared attention with other individuals. In the present study we investigated whether gaze perception and the tendency of humans to follow another individual's direction of gaze were intrinsically related to the mechanisms responsible for joint attention. Participants had to make a saccade towards a peripheral target, depending on the color of the fixation dot which appeared between the eyes of a face. At different intervals from the time of instruction, the face gazed either to the congruent or incongruent target location. The perception of gaze direction was manipulated by reversing the polarity of the contrast between the sclera and the iris (i.e. the sclera darker than the iris), while leaving every other aspect unchanged. For positive polarity eyes, saccades congruent with the direction of the distracting gaze had shorter latencies than incongruent saccades. We also found an increased number of erroneous saccades in the latter as compared to the former condition. Crucially, however, the negative polarity eyes eliminated the congruency effect found for the positive polarity eyes, and the predisposition to imitate somebody else's oculomotor behavior was substantially reduced. These results extend previous studies by revealing, for the first time, a direct link between the perception of gaze direction and the mechanisms involved in joint attention behaviors. Indeed, the contrast polarity of the eyes is not just crucial for consciously perceiving the direction of gaze, but also for influencing joint attention. Taken together, the findings fit the proposal that gaze direction is crucial to the triggering of joint attention.

POSTER 184

Dynamics of activation of the hippocampus-amygdala-entorhinal cortex system under controllable versus uncontrollable stress

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Emotionally stimulating experiences activate several physiological systems in distinctive brain areas, including limbic system elements, such as the hippocampus, the amygdala and the entorhinal cortex (EC). A system-level analysis of the limbic system may be required in order to describe accurately stress modulation of memory formation. The aim of the present study was to elucidate the activation pattern of the hippocampus (dorsal CA1), the amygdala and the EC following an exposure to controllable versus uncontrollable conditions under low or high levels of stress. The activation of cAMP response element-binding protein (CREB) was measured as a marker of initiation of memory-related processes in these regions.
Subjecting a rat to the Morris water maze spatial learning task is stressful to the animal. The invisible platform used in a spatial learning task in the water maze provides the animal with the possibility to escape, thus to gain partial control over the stressful situation. In accordance, matching the water exposure duration of the animal to the maze in the absence of an escape platform forms a matched uncontrollable condition. Warm (26 C) or cold (19 C) water temperatures were used in order to compare the response of controllable versus uncontrollable exposures under low or high levels of stress.
The main difference between activation patterns following spatial learning tasks under different stress levels focused not on whether activation was found in the hippocampus, but rather on a significant shift from hippocampal dominance under low stress to amygdalar dominance under high stress. A similar dominance shift towards the amygdala was observed when an uncontrollable exposure was employed under low stress levels; however, in the uncontrollable high stress condition, increased activation in all three areas was observed, including a marked level of activity in the EC relative to other experimental conditions.
It is suggested that the relative dominance of a specific region reflects the development of a coping strategy corresponding to a specific condition

POSTER 185

A new model of human spatial mapping.

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The ability of an organism to develop, maintain and act upon an abstracted internal representation of spatially extensive environments can provide an increased chance in ensuring that organism's survival. Here, we propose a neurocognitive model of spatial representation describing how several different processes interact and segregate the differing types of information used to produce a unified cognitive map. This model proposes that view-based egocentric and vestibulo-motor translational information are functionally and anatomically separate, and that these parallel systems result in independent, but interacting, models within a neurocognitive map of space. In this context, we selectively review relevant portions of the large literature addressing the establishment and operation of such spatial constructs in humans and the brain systems that underpin them, with particular reference to the hippocampal formation (HF). We present a reinterpretation of the types of knowledge used in the formation of this spatial construct, the processes that act upon this information, the nature of the final spatial representation, and describe how these universal concepts relate to the proposed model of spatial processing. The relevant experimental paradigms used to examine the neural basis of spatial representation and the main findings from previous research are also briefly presented. Finally, we detail a series of testable theoretical, behavioural and anatomical predictions made by the model.

POSTER 186

GHB effects on cocaine-induced place preference in mice

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GHB has become a common drug of abuse that additionally has proved to be efficient in reducing withdrawal symptoms and craving for alcohol and opiates. Since there is no effective treatment currently available for cocaine addicts, the present study aimed to evaluate whether GHB can affect the reinforcing effects of cocaine (50 mg/kg). The effect of a wide range of doses of GHB has been evaluated in cocaine-induced conditioned place preference (CPP). GHB (6, 12.5, 25, 50 and 100 mg/kg) was administered during either the acquisition (conditioning) or expression phase (test) of this conditioning. GHB administration during the acquisition blocks this process only when 100 and 12.5 mg/kg of GHB were used. The highest GHB dose does not counteract cocaine-induced hyperactivity, therefore the lack of motor stimulantion effect could not be responsible for the blockade of the cocaine-induced CPP. Conversely, administration of GHB during the expression phase of the conditioning showed no effect, all the groups presenting cocaine-induced preference. To test the possibility of an additive rewarding effect between GHB and cocaine, two threshold doses of cocaine plus the two high doses of GHB were administered during the acquisition phase, all the groups being positively conditioned, i.e. GHB does not counteract the rewarding effect of small cocaine doses. In conclusion, the results suggest that although GHB could be an instrument to take into consideration in cocaine addiction management, its potential addictive action has to be taken into consideration.

Acknowledgements
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POSTER 187

Investigation of brain adaptations underlying development of a drug-dependent state

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Hippocampal polysialylated neural cell adhesion molecule (NCAM PSA) has been shown to be involved in plasticity related memory consolidation processes (Fox et al., J. Neurochem., 65: 2796, 1995). Here, we show acute injections of several, different classes of drugs of abuse significantly increase the number of hippocampal NCAM PSA positive dentate gyrus cells in the rat. The total number of PSA-immunoreactive neurons was counted in seven alternate 12µm sections at –5.6 mm with respect to Bregma. Cell counts were standardised to cell number per area and mean±SEM were calculated for each animal group. The data resulting from these experiments showed a 70% to a 100% increase of PSA positive cells (heroin: 98.00±16.85, p = 0.0092; cocaine: 105±2.91, p=0.0001; amphetamine: 125.20±10.71, p=0.0001; nicotine: 91.40±2.84, p= 0.013; ethanol: 90.67±7.38, p=0.0418; student t-test). Repeated daily intravenous injections to either heroin or cocaine resulted in the loss of NCAM PSA activations between 7 and 14 days, suggesting memory of the drug experience had been consolidated. Moreover, at this time, appropriate functioning of the hippocampus became drug-dependent as animals failed to acquire a passive avoidance response in the absence of heroin or cocaine. These molecular and behavioural data suggest development of a drug-dependent state requires cellular hippocampal mechanisms necessary for memory consolidation. Supported by Enterprise Ireland

POSTER 188

Neuronal Activity in Orbitofrontal Cortex Co-varies with Delay and Reward Magnitude

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Orbitofrontal cortex (OFC) is critical to using the value of predicted outcomes to guide decisions. Neural activity in OFC varies with the quality and size of expected rewards. However decision-making is also influenced by indirect factors that impact reward value. For example, animals discount the value of delayed rewards, and this process depends on OFC. Here we ask if this time-discounting function affects encoding in OFC and if the effect co-varies with an effect of reward size. We recorded activity from >150 OFC neurons in rats performing a 2-well, 3-odor discrimination task. One odor cued the rat to go to the right well for reward, a second odor cued the rat to go to the left well, and a third odor cued the rat to choose between the wells. The relative values of the rewards available were manipulated across 4 trial blocks each day by varying the size of the reward or the delay preceding its delivery. Thus in one trial block, the left well was associated with a short delay and the right with a long delay; in the next block these contingencies were reversed. Reward size was manipulated similarly. True to reports, the rats' performance reflected the relative value of the wells across blocks, and OFC neurons fired to events in each trial, such as odor sampling, fluid well entry, and reward. These correlates were typically modulated by the length of the delay. For example cue or response-selective activity was often higher on short than on long delay trials. Moreover the effect of delay typically co-varied with the effect of reward magnitude. Thus a neuron that fired more to a cue when it predicted a high value, short delay would also fire more to that cue when it was associated with the high value, large reward. These results are consistent with the idea that activity in OFC encodes the discounted value of anticipated outcomes.
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POSTER 189

Reduction of the hand area in the homolateral primary motor cortex following unilateral section of the corticospinal tract at cervical level in monkeys

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Following a hemi-section of the cervical cord at level C7/C8 in monkeys, the homolateral hand exhibited a paralysis for two weeks, followed by an incomplete recovery of manual dexterity, reaching a plateau after 40-50 days. Recently (Schmidlin et al. 2004; Brain Res. 1017: 172-183), we showed that the recovery was related to the size of the lesion and, following a comparable time course, changes of the motor map in the contralesional motor cortex took place, in particular the hand representation. The goal of the present study was to assess, in three macaque monkeys, whether the hand representation in the ipsilesional M1 was also affected by the cervical hemisection. Very unexpectedly, based on the minor contribution of the ipsilesional hemisphere to the transected CS tract, a considerable reduction of the hand representation was observed also in the ipsilesional M1, nearly as large as in the contralesional hemisphere. The reduced ipsilesional hand representation did not contribute to the incomplete recovery of the manual dexterity for the hand affected by the lesion, as demonstrated by reversible inactivation (in contrast to the contralesional hemisphere). Moreover, the reduction of the ipsilesional hand area did not produce a decrease of manual dexterity for the hand opposite to the lesion. We hypothesize that the paradoxical reduction of hand representation in the ipsilesional hemisphere is secondary to changes taking place on the contralesional hemisphere, possibly corresponding

POSTER 190

Intracranial self-stimulation accelerates memory consolidation

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Previous experiments of our and other laboratories have shown that post-training intracranial self-stimulation improves memory in a variety of conditionings and paradigms in rats. Now we have administered post-training intracranial self-stimulation after one single brief session (5 trials) of two way active avoidance and tested memory after 24, 48 or 72 hours, in independent groups of subjects. 42 hours after training the treated rats showed a very significant increase of performance compared with control rats. This difference wasn't observed in 24 test and disappeared in 72 hours test. These results confirm our previous suggestions about the accelerative effect of intracranial self-stimulation on memory consolidation and provide an easy paradigm to go further the study of neural and molecular mechanisms of such facilitation.

POSTER 191

The role of dynamics in the perception of facial emotional expressions

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Facial displays of emotion is a highly dynamic phenomenon, however, researchers seem to underestimate the importance of motion in perception of facial expression and most of the studies use static displays of emotion as stimuli. The aim of the presented study was to assess the role of motion in the perception of emotional expressions. We hypothesized that motion may influence the perception of emotion intensity by providing dynamic information, providing static information (dynamic expression contains a number of static images) or facilitating perception of change. Subjects rated intensity of three facial expressions of negative emotions: fear, anger and disgust. Participants viewed facial expressions in four modes: (1) full expression (static picture), (2) series of images with increasing expression intensity (with mask in between, attenuating impression of movement), (3) dynamic (animation with impression of movement) and (4) neutral-full expression (full expression presented immediately after a neutral face). The main effect of motion was observed and dynamic expressions were rated as the most intense. Differences in intensity ratings: between dynamic (3) and static (1) conditions demonstrate the importance of motion; between dynamic (3) and neutral-full conditions (4) show that perception of change is less important for intensity ratings than dynamics; between dynamic (3) and series of faces (2) conditions indicate clearly that increase in intensity is caused by dynamic information contained in animations. Obtained results suggest that motion is an important factor influencing perception of negative emotional expressions by providing dynamic information.

POSTER 192

Synchronous activity in the nuclei Principalis, Oralis and Interpolaris of the rat under urethane anesthesia

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In the awake rat, 7 to 12 Hz synchronous activity has been observed at multiple levels of the sensorial trigeminal system. Also oscillatory field potential have been described in whisker-related cerebellar structures. Rhythmic activity is present in somatosensory cortex under urethane anesthesia centered in ~10 Hz. In brainstem trigeminal complex such synchronous activity was not reported. Our work is aimed at studying and comparing the synchronous and oscillatory activity in nuclei Principalis, Oralis and Interpolaris as a first approach to describe the origin, function and relevance of the brainstem oscillations in somatosensory information processing. A 9.5% of Pr neurons, 10.1% of Or neurons and a 19.0% of Int neurons present rhythmic discharge patterns. A 75% of the Pr neurons that present a rhythmic discharge pattern (24.8 ± 14.5 Hz) presents synchronous activity only under peripheral stimulation, 12.5% only at rest and 12.5% in both conditions. Or neurons oscillated at 37.5 ± 21.8 Hz, most of them (85.7%) only during whisker deflection and the remaining cells in the absence of stimuli. Int nucleus presents single unit oscillations with frequencies of 15.4 ± 8.55 Hz. Most of the neurons (72,7%) oscillated both at rest and under peripheral stimulation, 18,2% only during whisker stimulation and the remain oscillated only at rest conditions. As proved by the shift predictors most oscillations were independent on the stimulus onset. These synchronous activity suggest that brainstem trigeminal sensorial complex is not only a relay station and are involved in complex information processing tasks. This work is supported by Grants EU-IST-2001-34892, EU-IST-2001-34893, CICYT SAF2002-10935-E, CICYT SAF2002-10934-E, CAM 8.5/30/2003 and BEFI02/1767.

POSTER 193

Dopamine in the medial prefrontal cortex regulates rat`s behavioural flexibility in an operant behaviour system

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The medial prefrontal cortex (mPFC) is considered to be important for the regulation of behavioural flexibility and for the neural representation of reward value. Since it receives dopaminergic projection from the ventral tegmental area, we here tested, whether dopamine (DA) receptor blockers locally infused into the mPFC affect rats' behavioural flexibility measured in an operant behaviour system. Rats were trained in a two lever equipped Skinnerbox. The difference between the required lever responses for reward was nine responses for the efficient and 25 responses for the inefficient lever. The demand reversed when the efficient lever had been used seven times in a row. Ten reverses or 60 min ended the trial. Following parameters were recorded: (1) the time required per reverse, (2) the number of lever presses or pellets on the efficient/inefficient lever and (3) the switches to the inefficient lever per reverse. Upon reaching baseline rats received bilateral intra-mPFC-infusions of the DA D1-receptor antagonist SCH23390, the DA D2-receptor antagonist sulpiride (both 3 µg/0.5 µl) or phosphate buffer saline through chronically implanted cannulae. The time required per reverse increased after all microinjections. Both, DA D1 and D2 receptor antagonists increased the number of lever responses and pellets for the effective lever, which was apparently caused by an increased number of switches to the ineffective lever within one reverse. However, only blockade of DA D1-receptors increased the number of lever responses and pellets for the ineffective lever. Our data indicate that DA D1 and D2 receptors are

involved in the ability to remain at the efficient lever once it has been identified while DA D1 receptors additionally disturb the ability to cease responding on the previously more efficient lever once the demand for the levers reverses.
Supported by the DFG (SFB 517, TP A11)

POSTER 194
Startle response in spontaneously hypertensive rat: the effects of hydralazine on the response amplitude measured by two different methods
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Spontaneously hypertensive rat (SHR) is an animal model of human essential hypertension, and it also shows some marked difference in behavioral activity and reactivity. Such a behavioral characteristic of SHR suggests that their cardiovascular system could contribute to behavior control in the brain. This experiment was designed to examine the relationship between the magnitude of the startle response and blood pressure level in SHR using two different methods for the detection of bodily movements: a) a load-cell platform that only responds to perpendicular vibrations given at the bottom surface of the rat holder and b) a vibration pickup attached to the side wall of the holder to detect the bodily movements in various directions. Twelve SHR rats were divided into two equal groups: one group received 0.6 mg/kg of a vasodilator, hydralazine, and the other received normal saline. Following these drug administrations, the systolic arterial pressure and heart rate were measured. Subsequent to this blood pressure measurement, startle response measurements were made. In the results, the hydralazine-treated SHR group showed a significantly lower value of systolic blood pressure than the saline-treated group. As regards the integrated value of the output from the vibration pickup, the hydralazine-treated SHR group showed a significantly smaller value than the saline-treated group. For any other indices of response amplitude, no significant difference between the two groups was found. Furthermore, no significant difference was found in any indices of the peak latency between the two groups. These results suggested that the hydralazine treatment reduced the amount of some bodily movements which appeared in the acoustic startle response in the SHR rats, except the movements which exclusively related to vertical vibration.
This work was supported by Grant-in-Aids for Scientific Research (No. 12710049 and 16730376) from the MEXT of Japan.

POSTER 195
Dorso-ventral expression of polysialylated neural cell adhesion molecule in the dentate gyrus following passive avoidance conditioning
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The hippocampus, though anatomically similar throughout its dorso-ventral axis, has patterns of afferent and efferent connectivity that suggest functional heterogeneity. To investigate possible different dorso-ventral hippocampal contributions to learning, we used immunohistochemical techniques to map the expression of a neuroplastic marker, the polysialylated form of the neural cell adhesion molecule (NCAM-PSA). Given the rat hippocampus is a C-shaped structure with an overhanging dorsal lip, we sectioned the brain region in two directions. Firstly, we advanced in a rostro-caudal manner using coronal sections. Secondly, using the same brain tissue, we used horizontal sections to proceed in a dorso-ventral direction. These analyses were combined to describe the dorso-ventral distribution of PSA-positive neurons/unit area. Inter-animal consistency was maintained by defining the rostro-caudal and dorso-ventral co-ordinates by reference to bregma as described in a rat brain atlas. For initial studies with naive animals, we looked at 13 dorsal to ventral levels, through which we found differential NCAM-PSA expression. From these results, we chose 4 levels to investigate in animals 0h, 6h, 12h and 72h after training in a passive avoidance paradigm. We found a transient differential activation of NCAM-PSA at three of the four levels. The biggest proportional increase (41%) was observed in the ventral hippocampus 12h post-training (20.48±0.429 vs. 14.66±0.405). Increases were also observed dorsally, at 12h post-training (36.282±2.195 & 29.774±1.834 vs. 28.676±1.377 & 16.27±1.407 respectively). NCAM-PSA cell numbers returned to basal levels by 72h. This information adds further strength to the idea that the ventral axis of the hippocampal formation is associated with conditioning tasks. All experiments were reviewed by university ethics committee.
Funded by Enterprise Ireland

POSTER 196
Prevention of deprivation-induced changes to visual cortex by brief daily binocular exposure
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Continuous monocular deprivation (MD) during early postnatal life results in reduced cortical representation and visual acuity of the deprived eye. However, loss of visual function in one eye after just a brief period of compromised vision would appear to be maladaptive. The extent to which MD effects can be counteracted by balancing periods of MD with those of binocular exposure (BE) has not yet been established. We therefore reared kittens with a daily regimen in which they received variable amounts of MD and BE for about 3 weeks, and subsequently assessed the functional architecture of visual cortex with optical imaging of intrinsic signals (OI), followed by visually evoked potential and single cell recordings. In a first group of animals with 7 hours of overall daily visual experience, only 2 hours of BE allowed normal ocular dominance architecture to develop, and the result for 1 hour was close to normal. We then examined whether a minimum amount of BE or the ratio of BE vs. MD is critical in determining functional outcome independent of the overall duration of daily visual experience. A second group of kittens received mixed visual inputs for just 3.5 hours a day. We found that subjects with binocular experience as short as 0.5 hours possessed normal ocular dominance architecture, while for 0.25 hours of BE the cortical representation of the deprived eye was significantly reduced. Our results indicate

that periods of normal experience are more efficacious in driving visual cortical development than those of abnormal experience, and that the ratio of BE vs. MD appears to play a greater role in determining ocular dominance than the absolute amount of BE per day. Supported by the MRC.

POSTER 197

Intracranial self-stimulation ameliorates the memory decifit in rats bearing lesions of the basolateral nucleus of the amygdala

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We have previously reported that post-training intracranial self-stimulation was able to reverse the amnesic effects of parafascicular lesions on two-way active avoidance, in rats. Since the basolateral nucleus of the amygdala has been implicated in the modulatory effects of emotional arousal on learning and memory, we have now tested the possibility that intracranial self-stimulation could also reverse the detrimental effects caused by lesions of the basolateral nucleus on the same task. Besides to confirm that basolateral lesions impair conditioning and that intracranial self-stimulation improve it, our results showed that intracranial self-stimulation ameliorates the detrimental effects of basolateral lesions on two-way active avoidance. We, therefore, suggest that intracranial self-stimulation could be an effective way to improve learning and memory in rats with brain damage

POSTER 198

Visual recovery of touch

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Viewing the body is reported to improve tactile acuity (Kennett et al., 2001). The aim of the present study was to investigate whether this effect is dependent on the somatotopic congruency between the seen and touched body parts and whether it occurs only in subjects presenting low tactile sensitivity.
Therefore, 33 normal subjects performed a two point discrimination task (2PDT) in three conditions: looking at their stimulated forearm (ARM condition), at a rubber foot (FOOT condition) or at a neutral object (NEUTRAL condition). The results showed that 2PDT accuracy was higher in the ARM condition, but only in subjects with lower tactile spatial sensitivity.
Thus, it was hypothesized that the visual modality could improve tactile spatial sensitivity in subjects with tactile deficits. To test this hypothesis the same experiment was conducted on 10 brain damaged patients suffering a reduced somatosensory sensitivity. Again an amelioration of the performance was found in ARM condition.
In conclusion, tactile sensitivity can be ameliorated in brain damaged patients by the sight of the stimulated body part, thus suggesting that the interaction between different sensory modalities might be effective in recovering deficits in single modalities.

POSTER 199

Relativity and the brain: spatial effects on temporal duration judgements

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Chronostasis is a temporal illusion where the duration of an interval may be overestimated if, for example, the duration is initiated by an eye movement. This is most readily seen in the 'stopped-clock' illusion. Competing explanations for the basis of this effect are (i) backdating of perception to the onset of a motor act and (ii) the effects of arousal on the speed of an internal pacemaker. We investigated this first using an auditory task where backdating was prevented by a random interval between a motor response and stimulus onset. In this task chronostasis was seen in the absence of backdating when tones marking an interval to be judged were presented in different ears but not when they were presented in the same ear. Data obtained were also not consistent with a general increase in arousal. In a second task, involving visual stimuli, we investigated the possibility of a spatial factor in the illusion by manipulating the distance between the motor response initiating a counter and the stimuli to be judged. The duration of the stimulus judged was perceived as longer in the condition where the initiating motor act was further in spatial distance from the counter. These data suggest that chronostasis may be partly dependent on the spatial separation of the location of motor response and the source of the stimuli to be judged. When the stimuli and response were spatially contiguous chronostasis did not occur. When the stimuli and response were spatially segregated then chronostasis occurred as normal.

POSTER 200

Synaptic changes in frontal cortex underlying altered executive functions in pre-symptomatic in G93A +/+ mice over-expressing the human Cu/Zn superoxide dismutase (Gly93 -> ALA) mutation

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Although amyotrophic lateral sclerosis (ALS) is mainly considered as a motor disease, central neural alterations underlying a deficit in executive functions have been reported in ALS patients. There is evidence that mutations in the Cu/Zn superoxide dismutase

(SOD1) gene are implicated in about 20% of familiar ALS and mice over-expressing human mutant SOD1 (G93A+/+) show an ALS-like phenotype. The present experiments examines whether cognitive and central neural alterations resembling those described in ALS patients can also be found in G93A +/+ mice before the onset of the motor neuropathy. Latent inhibition and the capability to extinguish fear conditioning responses were estimated in G93A +/+ mice and their null mutants littermates. In addition, several indexes of frontal cortex morphology based on Golgi-Cox staining were analysed. Mutant mice exhibited impaired attention and defective behavioural flexibility whereas reduced branching and more immature spines were found on apical dendrites of prelimbic and infralimbic cortical neurones. These alterations observed before the appearance of the motor disease suggest the existence of early behavioural and morphological markers of ALS for the familiar forms associated with mutations in the Cu/Zn superoxide dismutase (SOD1) gene.
This work was supported by a grant from MIUR (FIRB N° RBAU01A7T4_002

POSTER 201

Dose-dependent antidepressant effect of chronic lithium in Porsolt forced swim test

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Lithium (Li) has been in clinical use for more than 50 years, but its mechanism of mood stabilization is still unknown. Previous reports of Li's antidepressant effect in the Porsolt Forced Swim Test (FST) model of depression were equivocal. O'Brien et al (1) have recently used a specific regime of chronic Li treatment in mice and found a strong antidepressant effect. The goal of present work was to study whether the antidepressant effect of chronic lithium administration in mice is dose-dependent and replicable if a stringent administration protocol is carried out and blood levels of > 1mM Li are achieved. Mice received 0.2% lithium chloride in food for an habituation period of 5 days, as described O'Brien et al, followed by 0.25% or 0.4% or 0.5% for additional 10 days. Immobility time in the FST was monitored on day 15, after which blood was taken for Li levels by cardiac puncture. [ANOVA reveals significant difference between groups $F(3,37)=30.53$, $p<0.05$] Li doses of 0.4% and 0.5% resulting in blood levels of 1.3 + 0.2 [SD] mM and 1.4 + 0.3 mM significantly reduced immobility time by 60% and 82% respectively, compared with the control group (Post-hoc LSD $p<0.05$). Mice treated with Li dose of 0.25%, which resulted in blood levels of 0.8 + 0.3 mM, were not different from the controls in this test.
A Li administration protocol resulting in Li blood levels of > 1mM causes a robust antidepressant effect in the FST.
Reference:
1. O'Brien WT, Harper AD, Jove F, Woodgett JR, Maretto S, Piccolo S, Klein PS: Glycogen synthase kinase-3beta haploinsufficiency mimics the behavioral and molecular effects of lithium. J Neurosci 2004; 24(30):6791-8

POSTER 202

Post-training intrahippocampal infusion of nicotine prevented spatial memory retention deficits by the Cyclooxygenase-2-specific inhibitor celecoxib in rats

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In the present work, we have investigated the effects of nicotine, infused in the rat dorsal hippocampus several minutes after infusion of celecoxib, on memory retention in the Morris water maze. Bilateral intrahippocampal infusion of celecoxib (0.1 M) increased escape latency and travel distance in rats, indicating significant impairment in spatial memory retention. We also examined effects of bilateral infusion of nicotine (0.5, 1.0, and 2.0 µg/side) on memory retention. Infusion of 1 µg nicotine significantly decreased escape latency and travel distance but not swimming speed, compared to controls, suggesting memory retention enhancement by nicotine at this concentration. In separate experiments, bilateral infusion of nicotine, infused 5 min after 0.1 M celecoxib infusion, showed escape latency, travel distance and swimming speed profiles very similar to the control animals. Immunohistochemical staining analysis of brain tissues with anti-COX-2 antibodies showed that COX-2 infusion alone qualitatively reduced the number and density of COX-2-containing neurons in the dorsal hippocampus, and that the immunostaining pattern was qualitively similar to controls for rats receiving a combination of celecoxib and nicotine. These results suggest that nicotine prevented or reversed the adverse effects of celecoxib on spatial memory retention.

POSTER 203

Error Correction in Healthy Subjects and Cocaine Users : an fMRI study.

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Achieving goals requires monitoring the consequences of the actions and detecting errors. Detecting and correcting errors is crucial to be able to learn from previous experiences. Previous imaging studies reported the anterior cingulate cortex (ACC) and the dorsolateral prefrontal cortex are critical areas in error processing. A recent fMRI study compared the brain activity of healthy controls and cocaine addicted subjects during a Go-NoGo task. The ACC was less active in chronic cocaine users, suggesting that this drug affects the brain structures involved in the cognitive control of behaviour. The present work aims to explore further the functional neuroanatomical correlates of error correction.
In this experiment 13 subjects (7 controls and 6 cocaine users) completed a Go-NoGo task in which the letters X and Y were presented serially in an alternating pattern at 1 Hz, and subjects had to make a button response for each letter. Subjects were asked to withhold their responses when the alternation order was broken (e.g. the

fifth stimulus in the train X Y X Y Y X). In the Single-Lure (SL) condition the 80 NoGo stimuli (lures) were always followed by a Go stimuli. In the Double-Lure (DL) condition there were 44 single lures, and 18 double lures, in which two successive response inhibitions were required (e.g. the fifth and sixth stimuli in the train X Y X Y Y Y X). Experiments were conducted in a 1.5 T scanner and data was analysed using AFNI software.
Behavioural data shows that both subject groups made fewer commission errors to the second lure in the DL condition, showing that the SL Vs. DL manipulation worked. Furthermore, subjects tended to slow down their responses after a single lure in the DL condition but not in the SL condition.
Functional results show stronger brain activation for the controls than for the users in midline regions following a successful inhibition after a single lure in the DL condition. Based on these preliminary results, we expect the midline regions to be responsible for this corrective behaviour, although further analysis is necessary.
Acknowledgements and References:
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POSTER 204

Stereocapnesthesia and the treatment of panic attacks

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Klein (1993) proposed that panic attacks are triggered by increased levels of carbon dioxide, producing a false suffocation alarm in sensitive individuals. Ley (1994) argued, however, there that increased CO2 concentrations in the blood (hypercapnia) often do not produce suffocation feelings or panic, and stopping hypercapnia by hyperventilation does not stop a panic attack. The discrepancy is resolved by understanding that panic attacks are triggered - not by hypercapnia per se - but by the perception of increased CO2 in the air. This perception is provided by "stereocapnesthesia." Just as two eyes provide stereoscopic vision and two ears allow stereo hearing, the two distinctly-placed CO2 receptors in land animals provide the ability to localize the source of increased CO2 as internal or external. Higher metabolism causes more change at the core CO2 receptor in the medulla of the brain, but higher ambient CO2 causes more change at the CO2 receptor in the aorta. In addition, comparing observed with expected reductions in aorta CO2 after a breath of a particular volume provides a further estimate of external CO2 levels. Proof that the difference between externally-caused and internally-caused increases in CO2 can be perceived is provided by the fact that, although both cause hyperventilation, they cause quite different responses otherwise. Metabolic hypercapnia (e.g., after a race) causes lower the head, lying down and remaining in one place with a satisfied feeling; elevated CO2 in the air (e.g., seen when sacrificing rats) causes raising the head, standing up and moving around frantically, trying to escape. Consequently, although lowering the core CO2 level does not help, lowering the CO2 in the inhaled air with a hand held scrubber blocks panic attacks, as recently demonstrated in a single-blind clinical trial by Stephen Cox (presented at NCDEU, Boca Rotan, June 6-9, 2005). He found a highly significant (p[7]=0.00006) difference between active scrubbers (85 ± 9 % SEM efficacy) and placebo (3 ± 2% efficacy).
No outside funding.

POSTER 205

Electrophysiological Comparison of Cognitive Impairments In Multiple Sclerosis (MS) And Neuro-Behçet's (NB) Diseases By Using Event Related Potentials (ERP's)

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MS & NB disease processes are similar from the neurological perspective as somatic neurological signs predominate and both cause exclusively subcortical involvement. It's reported that MS & NB would lead to similar cognitive impairment patterns characterized by executive dysfunction and memory impairment with relatively intact linguistic processing. In a previous study, the performance of NB patients on neuropsychological tests emphasizing frontal lobe functions was significantly worse than that of MS patients that were matched for age, disease duration, EDSS and education. Our working hypothesis is that the worse executive functions of NB patients are associated with more pronounced disconnection of fronto-striatal circuits due to the additional subcortical gray matter involvement. In this study, ERP recordings sensitive to frontal system functions were used with the aim of revealing the electrophysiological correlates of the above-mentioned difference in the severity of cognitive symptoms for the same group of patients. ERPs were recorded using the Continuous Performance Test(CPT), Novelty paradigm and Contingent Negative Variation(CNV) paradigm. While no significant difference was found either in CNV potentials, or in P3a & P3b potentials of the Novelty paradigm and Go-P3 potentials of the CPT paradigm, the amplitudes of Nogo-P3 potentials in the CPT paradigm were significantly smaller in the NB group compared with the MS group. These results showed that the response inhibition process is more impaired in NB patients than in MS patients, while no difference was observed between the two groups of patients for novelty detection, sustained attention, expectation or motor preparation. More severe dysfunction of inhibition for NB patients than MS patients might reflect more severe involvement of the orbitofronto-striatal circuits in NB patients.

POSTER 206

Restoration of learning ability in rats with hyperammonemia and with liver failure by oral administration of sildenafil

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Hepatic encephalopathy is a complex neuropsychiatric syndrome that includes a wide range of neuropsychiatric disturbances ranging from minimal changes in personality or altered sleep–waking cycle to deep coma and death. Subjects affected by liver cirrhosis who presents normal neurological or mental status examination present subclinical forms of hepatic encephalopathy showing intellectual function impairment. Rats with portacaval anastomosis or with

hyperammonemia without liver failure also show impaired learning ability and impaired function of the glutamate-nitric oxide-cyclic GMP pathway in brain. We hypothesized that impairment of learning ability is consequence of the impaired function of the pathway and that pharmacological manipulation of this pathway to increase cGMP could restore learning ability. We carried out tests of conditional discrimination learning in a Y maze with control rats and with rats with liver failure (portacaval anastomosis) or with chronic hyperammonemia without liver failure. We show by in vivo brain microdialysis that chronic oral administration of sildenafil, an inhibitor of the phosphodiesterase that degrades cGMP, normalizes the function of the Glu-NO-cGMP pathway and extracellular cGMP in brain in vivo in rats with portacaval anastomosis or with hyperammonemia, and restores the ability of rats to learn the conditional discrimination task. These results support that impairment of learning ability in rats with chronic liver failure or with hyperammonemia is a consequence of impairment of the Glu-NO-cGMP pathway. Moreover, chronic treatment with sildenafil normalizes the function of the pathway and restores learning ability in rats with portacaval shunts or with hyperammonemia. Pharmacological manipulation of the Glu-NO-cGMP pathway may be useful for the clinical treatment of patients with overt or minimal hepatic encephalopathy.

POSTER 207

The role of the frontal eye fields (FEF) in auditory attentional capture

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The controversial premotor theory of Rizzolatti et al., (1987) proposes that shifts of covert attention are planned but unexecuted eye movements. There is now converging neuropsychological evidence that supports the idea that visual attention is, under certain circumstances, dependent on activity in the oculomotor system (e.g. Smith et al., 2003; Craighero et al., 2002). Interestingly, there is also some evidence that planned eye-movements can affect non-visual, auditory attention. For example Rorden & Driver (1999) have shown that auditory attention is oriented to the endpoint of a planned saccade. To further investigate the role of saccade planning in auditory attention, TMS was used to interfere with the functioning of a cortical area known to be involved in the production of saccades, the frontal eye field (FEF), as participants performed a task involving auditory attentional capture. Double-pulse TMS (dTMS) was delivered over the FEF 50 and 100ms before the onset of an auditory target which had been pre-cued by a non-predictive burst of white noise. Preliminary results indicated that dTMS significantly reduced the facilitatory effect of a valid cue, suggesting that the human FEF is involved in the deployment of auditory attention. These findings are consistent with previous studies of visual attentional capture, in which FEF stimulation elicited a significant reduction in the cost of an invalid cue (Smith et al., PhD thesis). These results demonstrate for the first time that the oculomotor system is critically involved in auditory attentional capture.

POSTER 208

Perfusion With Trh Into The Medial Prefrontal Cortex Following A Mild Local Injury Increases Local Glutamate Release In The Rat.

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This study investigated the effects of the tripeptide thyrotrophin-releasing hormone (TRH) on dialysate glutamate levels in the left medial prefrontal cortex (mPfc) and ventral tegmental area (VTA) following a mild impact (0.87 mm deformation) to the left mPfc. Immediately after impact dual probe microdialysis in the isoflurane-anaesthetised rat was employed whereby one microdialysis probe was implanted into the left mPfc and a second into the ipsilateral VTA. TRH (0.1, 1 and 10 mM) was perfused only into the mPfc throughout the experiment. The effect of intra-mPfc perfusion with TRH was also investigated in the presence of a depolarising concentration of KCl (100 mM, 20 min).
Impact dialysate levels measured in the mPfc and VTA 25 min after impact in mildly-injured control rats (n=4-6) were 8±1mM and 12±0.8mM respectively and increased by 125% ($p<0.001$ v's impacted controls) and 17% to 18±0.8mM and 14±0.5mM in the presence of a 10 mM concentration of TRH. A similar dose-dependent increase in basal dialysate glutamate levels was also observed 265 min after impact. Intra-mPfc KCl (n=3-4) increased local dialysate glutamate 4-fold following mild impact. However in the presence of TRH the KCl-induced increase was dose-dependently reduced due to the TRH-elevated basal levels in both the mPfc and VTA.
In conclusion, the data shows that following a mild injury to the mPfc TRH increases local glutamate release and activates the mPfc-VTA glutamate pathway probably via a TRH receptor located on a glutamate containing pyramidal neuron in the mPfc. Furthermore, the lack of ability of intra-mPfc KCl to further enhance the TRH-induced elevation in basal dialysate glutamate levels suggests that TRH and KCl may operate via a similar mechanism to increase glutamate release in the mPfc. This finding may be important in the ongoing search for newer and safer neuroprotective agents.

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POSTER 209

Preliminary studies of the delayed behavioural effects of post-natal exposure to PCB 153 in female mice

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Polychlorinated biphenyls (PCBs) constitute a large category of chlorinated hydrocarbons that have been detected in the environment. Cognitive impairments, decreased verbal abilities and reduced psychomotor development have been associated with perinatal exposure to PCBs.
Female C57/BL6J mice were administered 5.1 mg/kg of PCB 153 p.o. on post -delivery day 10 and then tested on hippocampal-dependent spatial working memory in a T maze continuous alternation task and exploratory /locomotor activity in a hole-board task once the mice reached 2 months of age.
Training in the T maze consisted of one single session, with one forced-choice trial, followed by 14 free-choice trials. The percent alternations was reduced in PCB 153 treated animals (25.5 ± 6.4%) compared to vehicle treated (54.3 ± 4.3%) animals (F1, 10=2.540, P<0.05).
The hole-board task consisted of 2 sessions, each lasting 3 min with a 10 min inter-trial interval. PCB 153 had no effect on the number of line crossings (t1, 10= -1.2, ns), time in the centre (t1, 10=-0.2, ns), and head dips (t1, 10 = 1.5, ns) in the first session compared to vehicle treated mice. Both vehicle and PCB 153 treated mice habituated well to the task between sessions (t1, 8= 73232, p<0.001 and t1, 8= 4.814, p< 0.001, respectively) as measured by line crossings.
In summary, in these preliminary studies, PCB 153 caused a deficit in spatial working memory in female mice, but had no overall effect on exploratory / locomotor or anxiety-like behaviour. Therefore, PCB 153 is possibly affecting spatial hippocampal function. Further work is on going, the study is now being repeated with ß estrogen receptor knockout mice to determine if the ß estrogen receptor is involved in any deficit produced by PCB 153.

POSTER 210

Cocaine-exposure causes abnormal encoding of cue value and predicted outcome in the orbitofrontal-amygdalar circuit

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Psychostimulants cause long-lasting changes in markers of function in the orbitofrontal cortex (OFC) and basolateral amygdala (ABL). These circuits are critically involved in the process by which neutral cues acquire value and become associated with outcomes. Here we report that cocaine exposure causes reciprocal changes in single-unit representations of cue value and predicted outcomes in these areas. Rats were exposed to cocaine daily for two weeks (30 mg/kg i.p.). After a month, recordings were made from OFC or ABL neurons as the rats learned and reversed a series of odor discriminations, in which one odor predicted sucrose and the other quinine. In OFC, rats exposed to cocaine displayed abnormal encoding during learning, failing to activate representations of outcomes during sampling of odor cues after learning. For example, only 6% of quinine-expectant neurons became responsive to the predictive odor cue vs. 30% in controls. By contrast, rats exposed to cocaine displayed normal encoding in ABL during learning; many neurons rapidly developed cue-selective firing activity, and a significant proportion of these cells developed out of an outcome-selective population. However upon reversal, cocaine-treated rats displayed abnormally persistent encoding of the pre-reversal associations in these populations. Thus, while 48% of the cue-selective cells reversed in controls, only 14% did so in the cocaine-treated rats. These results show that chronic cocaine exposure disrupts encoding of predicted outcomes in prefrontal areas and causes abnormally rigid representations to develop in critical subcortical associative learning nodes. Such changes could account for addicts' difficulty in modifying their behavior in the face of adverse consequences.
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POSTER 211

Central muscarinic blockade with scopolamine interferes with efficient solution of the Active Allothetic Place Avoidance (AAPA) task by rats

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Place navigation requires a brain representation of the environment in the form of a cognitive map, dependent on hippocampus. Intact function of muscarinic acetylcholine receptors in the brain was originally considered to be crucial for place navigation, however, recent studies using non-spatial pretraining demonstrated that animals with blockade of muscarinic acetylcholine receptors in the brain can also learn and retrieve spatial memory engrams. Aim of the present study is explain role of muscarinic acetylcholine receptors during Active Allothetic Place Avoidance (AAPA) task, requiring animals to actively avoid a room-frame-defined sector on a continuously rotation arena. A unique feature of this task is that the rats have to solve a conflict between two discordant subsets of spatial stimuli. Stimuli from arena and room reference frames are encoded simultaneously but independently in the brain. Information from the room frame is brought into conflict with cues from the arena frame by rotation of the arena. But only navigation based on the room frame leads to successful avoidance. Rats thus must distinguish between these two classes of information and aselect the room frame as the relevant one for efficient AAPA solution. We studied the effect of three doses of scopolamine (0.5mg/kg, 1.0mg/kg and 2.0mg/kg, i.p.) injected 20 min prior to training on the retention of the AAPA and re-acquisition of the AAPA in a new environment. The dose of 1.0 mg/kg impaired the reinforced retention of AAPA and the dose of 2.0 mg/kg impaired both AAPA retention and re-acquisition of the AAPA. It is concluded that muscarinic acetylcholine receptors in the brain may not be involved in pure allothesis but, more likely, they play role in higher cognitive processes involved in the AAPA. This study was supported by the GACR grants No. 309/03/P126 and No 309/03/0715 and by MSMT CR project 1M0002375201.

POSTER 212

Evaluation of learning deficit and effect of Cilostazol in temporal cerebral ischemic mice

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We examined the disability and recovery of learned behaviour after ischemia using operant conditioning task in mice. Cilostazol, an anti-platelet agent, increases cerebral blood flow and decreases size of cerebral edema after the ischemia, can be expected to improve brain function. Effect of chronic administration of Cilostazol on the behaviour was also investigated.
Male mice were trained for reacting to illuminated key as soon as possible. When the subject's reaction time was stable bilateral common carotid artery occlusion for 10 min was performed on the half of the subjects and sham-operation was conducted on the remained half. Cilostazol administration was started on the next day of the operation and continued by the end of the experiment. A half of subjects in each operation group were gave Cilostazol in methyl cellulose (vehicle) and the other half received the vehicle only. After a week recovery period, subjects were retrained for three months. As indexes of learning, correct reaction ratio and reaction time were subjected for analysis.
In the ischemic subjects, the correct reaction rate and reaction time were worsened drastically and gradually recovered to under the pre-operation level by re-training even for three months. Although the Cilostazol had no effect on the speed of recovery, subjects administrated Cilostazol did not shown temporal decrease of the reaction rate observed in the vehicle treated group. In the sham-operated groups, the correct reaction ratio was slightly decreased after the operation, but returned the pre-operation level within a week. There was no effect of Cilostazol in the sham-operated groups and no temporal decrease of the reaction rate showed in the ischemia-vehicle group was observed. From these results we suggested that Cilostazol may diminish the ischemia-induced learning disability in the chronic phase.
Cilostazol was provided by Otsuka Pharmaceutical Co., Ltd., Japan.

POSTER 213

Functional specialization of different sub-regions of the somatosensory thalamic nuclei in the rat.

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It is commonly known, that the same stimuli can exert different behavioural reactions in different behavioural contexts, which can be observed in phenomena of habituation/sensitization and attention. One of the mechanisms underlying above phenomena in the somatosensory system could be a relative change of the tactile information processing within parallel thalamo-cortical loops. In order to investigate this dynamics, we studied the contextual modulation of the local field potentials evoked (EP) in thalamic somatosensory nuclei by vibrissae stimulation in awake rats. The EPs were recorded by means of several electrodes implanted chronically to different sub-regions of the ventral postero-medial (VPm) and the medial posterior (POm) nuclei. EPs recorded when an animal was habituated to the experimental conditions differed significantly from those obtained when it was aroused by additional aversive stimuli. Application of the principal component analysis allowed us to differentiate EPs recorded at close thalamic locations and to find that the contextual EP difference was pronounced in ventro-lateral and posterior VPm and posterior POm. We conclude that specific sub-regions of both VPm and POm are differently involved in tactile information processing when an animal is quiet or aroused.
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POSTER 214

EEG and behavioural analysis of Alzheimer model animals

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This study is to develop the Alzheimer's disease (AD) detection and analysis system using brain signals including EEG (electroencephalogram) and ERP (event-related potential) and behavioural scores of AD model animals. We made AD model animals by injecting the immunotoxin (192 IgG Saporine) into medial septum to lesion the cholinergic neurons of hippocampus selectively. EEG was recorded through the intracranial electrodes implanted in hippocampus CA1, and the skull screw electrodes over frontal and parietal cortex, totally from 11sites. During well-controlled behavioural paradigms including water maze training, elevated plus maze training, fear conditioning and tone oddball task, EEG /ERP and behavioural scores were measured. We made a feature pool including the chaotic features as well as spectral and statistical features, the spatio-temporal patterns, and the phase information of the signals. The combined genetic algorithm / artificial neural network approach, and the correlation analysis were applied to find a minimal set of the dominant features from the feature pool, that are used as an optimal inputs of the artificial neural network to classify the AD and normal animals. This analysis system could be extended to a reliable classification system using EEG recording that can discriminate between groups.

POSTER 215

The contribution of the ventromedial prefrontal cortex to the stimulus-based attentional switching

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Recent neuroimaging evidences suggest that neural mechanisms involved in the switching of attention are organized in the prefrontal cortex (PFC) according to distinct level of abstraction. Specifically, Cools et al. (2004) have proposed that the ventromedial portion of the PFC is involved in the lower-order switching between concrete stimuli but not in the higher-order switching between abstract task rules which, in turn, is carried by the dorsolateral PFC. In the present study, we aimed at examining the effects of focal lesions to the ventromedial PFC on the stimulus-based and rule-based attentional switching. Patients who had undergone surgery of the anterior communicating artery aneurysm and normal control subjects (C), participated in the study. The patients were subdivided into three groups: with resection of the left (LGR+) or right (RGR+) gyrus rectus, and without such a resection (GR-). The Trail Making B test was used as a measure of the stimulus-based switching, whereas the Category test was used as an instrument to assess the rule-based switching. On the Trail Making B test, the LGR+ and RGR+ groups performed worse than both the GR- and C groups. On the Category test, all tested groups did not differ significantly from each other. These findings confirm the specific contribution of the ventromedial prefrontal cortex to the stimulus-based attentional switching.

POSTER 216

Auditory perception of temporal order

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A complete understanding of our sequencing abilities requires characterization how the nervous system process the Temporal Order (TO) in different time domains. Substantial evidence demonstrated that for two-element sequences the Temporal Order Threshold (TOT), i.e. the minimum interval between the stimuli at which a person reports correctly their TO, lies around 30-60 ms. The aim of the present study was to test the TOT for four-element auditory sequences. Specifically, we investigated the effect of the stimulus quality and subject age on this processing.
Subjects aged either 20-30 years (n=16) or 60-70 (n=16) years were requested to identify the TO of: (1) syllables; (2) tones of 400 Hz or 1800 Hz; (3) sound combinations (like: a hiss - a buzz - 400 Hz tone -1800 Hz tone). Four stimuli within each sequence were randomly ordered and presented with a pause between consecutive stimuli. The TOT was assessed for these three tasks.
The significant effect of both the stimulus quality and subject age on the TOT was found. For syllables, the TOT was around 360 ms, however, this value was higher for sounds (ca. 600 ms) and shortened for tones (ca. 130 ms). Moreover, the older subjects displayed significantly higher TOT than the younger ones.
These data show that the sequencing ability for four-element sequences is strongly influenced by both the stimulus quality and the subject age. The TOT of ca. 360 ms for syllables may correspond with the temporal organization of language and point to a specific timing mechanism characteristic for processing of syllables which in natural speech occur with a frequency of ca. 4 Hz. The TOT corresponding with this temporal platform seems strongly stimulus-dependent and may be lowered or prolonged when the nonverbal stimuli are processed. Age-related changes in the perception of TO may suggest the prolongation of the speed of information processing, or slowing down of the hypothetical "pacemaker" in advanced age.
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POSTER 217

The perception of temporal order for auditory stimuli: the effect of age and gender

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Psychological studies have suggested that the minimum Inter-Stimulus-Interval (ISI) between two successive stimuli necessary to report correctly their Temporal Order (TO) is about 20-60 ms. There exists also some evidence that women need longer ISI than men to report TO correctly, thus, in men the Temporal Order Threshold (TOT) is lower than in women. The aim of the present study was to compare the level of performance in temporal ordering task in two age groups and to test sex differences in the perception of TO.
Two groups of subjects were studied: young (aged 20-29 years) and elderly (60-69). All subjects were right-handed, without any damage to the nervous system. Subjects identified the TO of two acoustic stimuli. In the inter-hemispheric task, two 1-ms clicks were presented one to each ear, whereas in the intra-hemispheric task two tones of 400 and 3000 Hz were presented binaurally. The TOT was defined as the minimum ISI required to report this order at 75% of correct responses. In both experiments, the TOT was assessed using the YAAP procedure, thus, ISIs in particular trials were adjusted on the basis of correctness of subject's previous responses.
The younger subjects showed lower TOT than the older ones (mean TOTs 48 and 82 ms, respectively). Moreover, to report correctly the TO of two sounds women needed on average 78 ms, whereas men only 52 ms. Inter-hemispheric task was more difficult than intra-hemispheric one (mean TOTs 77 and 54 ms, respectively).
The deterioration of performance observed in elderly subjects may reflect the general slowing of information processing. Sex differences may be explained by differences in gray/white matter ratio in the brain or a rate of the pacemaker in hypothetical "internal clock". The inter-hemispheric stimulation seems more difficult than intra-hemispheric one probably due to the integration of information from both hemispheres.
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POSTER 218

The Automated Spatial Array Task, a novel method for measuring hippocampal sensitive memory in a touch screen equipped operant box

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Inspired by the Morris Water Maze, we developed a task that takes advantage of touch screen technology to measure working (within a session) and reference memory (between sessions) simultaneously in an automated operant task. This task is quickly learnt, giving it great potential as a high-throughput screen to measure effects on learning and memory. In the Automated Spatial Array Task male Lister-Hooded rats are presented with an array of gray squares displayed on a touch screen monitor. Hidden within this spatial array is a rewarded location (S+), identical to all of the other squares in appearance, except that touching it results in the delivery of a food reward, whereas touches at the other "distracter" locations have no effect. Within a session the S+ remains in the same location on the touch screen, but its location changes between sessions. Early in a session, a rat must search through the array to find the new S+. As the session progresses, the rat rapidly learns the location of the S+ and the number of visits to distracter locations decreases. Accordingly, total errors to find the S+ within a session serves as a measure of working memory, whereas errors at the S+ from the previous testing session serves as a measure of reference memory. Neurotoxic lesions of the hippocampus were found to cause long-lasting increases in both working and reference memory errors. Latency to retrieve a reward was not affected by the lesion, suggesting that the effect is cognitive and not the result of a motor or motivational impairment. It is not yet clear whether deficits seen in this task after hippocampal lesions are the result of impairment of allocentric spatial learning and memory, or another type of memory also dependent upon this structure, this task does provide an automated high-throughput test of hippocampal-sensitive memory.
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POSTER 219

Expression of NCAM polysialylation in the prefrontal cortex: task-specific activation during memory consolidation

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The bidirectional connection between hippocampus and prefrontal cortex plays an important role in memory formation, in particular, for spatial information. While it is well established that long-term memory formation involves synaptic reorganisation in the hippocampus, the requirement for similar structural rearrangement in the prefrontal cortex remains unclear. Both passive avoidance and water maze learning-induced neuroplastic change in the hippocampus is dependent on transient up-regulation in the polysialylated form of the neural cell adhesion molecule (NCAM PSA). Here, we demonstrate that similar NCAM PSA-positive cell populations are expressed in all sub-regions of the prefrontal cortex including cingulate, insular, orbitofrontal and infralimbic cortices. In the cingulate cortex, as in the frontal cortex, these neuroplastic cells are predominately glutamatergic pyramidal neurons while in the insular, orbitofrontal and infralimbic cortices, there are equivalent numbers of glutametergic pyramidals and GABAergic interneurons. Moreover, no increase in NCAM-PSA-positive cells was observed in any prefrontal subregion after the passive avoidance paradigm. However, water maze training was accompanied by an increase in NCAM PSA neuron frequency in the infralimbic/orbitofrontal and insular cortex ($p=0.037$ and $p=0.030$, respectively, Student's t-test, one-tailed). Thus, similar synaptic plasticity may be mobilised within these prefrontal regions during the consolidation phase of spatial memory as has previously been observed in the hippocampus. The results also suggest that only tasks with a working memory component recruit NCAM PSA-mediated neuroplasticity in the prefrontal cortex during consolidation. All experiments were reviewed by the Animal Research Ethic Committee, UCD. Supported by Science Foundation Ireland.

POSTER 220

Qualitative and quantitative analysis of NMDA receptor subunit distribution in adult cat visual area 17

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NMDA receptors play a vital role in a variety of neuronal cortical functions. To better understand the role of this type of glutamate receptor in mammalian brain, we examined qualitatively and quantitatively, in adult cat visual cortex, the NR1, NR2A and NR2B subunit distribution. Immunocytochemistry revealed a characteristic laminar and cellular distribution pattern for each of the three NMDA subunits, as well as for phosphorylated NR2B (Ser 1303). Cell countings, complemented by data obtained through Western blotting, revealed semi-quantitative subunit-specific expression differences between central and peripheral area 17, and between cortical layers. While Western blotting showed a clearly higher NR1 expression in central area 17, this difference could not be found with immunocytochemistry. Hence, there is no difference in the number of cells expressing the NR1 subunit, but on the contrary, individual cells express more NR1 subunits in central area 17. For NR2A and NR2B layer-, but not region-, specific differences were observed. These findings reflect the importance of the NR1 subunit, being the key of any functional NMDA receptor, accompanied by the NR2 subunits, to define region- and layer-specific functional receptor characteristics in mammalian neocortex.

POSTER 221

The impact of survey versus route perspective on mental images constructed from visual experience or verbal descriptions

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Mental images constructed through the visual examination or the verbal description of a spatial configuration have been shown to hold metric properties of that configuration. We investigated such properties in mental images constructed in conditions resulting from the combination of a visual or a verbal mode of acquisition, and of a survey or a route perspective. Participants memorized a virtual circular garden containing six objects, in one of four conditions: (1) viewing a map of the garden (2) viewing a video presentation of a journey around the garden; (3) listening to a verbal description of the map; (4) listening to a verbal description of the journey. The tests consisted of mentally comparing the distances separating objects. The frequency of correct responses was higher and response times were shorter when the environment had been learned visually than by a verbal description, and when Learning From A Survey Perspective Than From A Route perspective. A global symbolic distance effect was obtained, in that the greater the difference between two distances being compared, the higher the frequency of correct responses and the shorter the response times, except in the last condition (4). These findings show that mental spatial representations are more accurate and/or easier to access when they have been constructed from a survey perspective and by the visual modality.
In a further study of mental scanning using fmri, we investigated the neural substrates involved in distance estimates as a function of the perspective of learning (route versus survey). preliminary analyses reveal a common activation of a parieto-frontal network, whereas survey and route learning activate the parahippocampal gyrus and the inferior parietal lobule, respectively. the specific implication of the parahippocampal gyrus, as well as the absence of hippocampal activation, are discussed.

POSTER 222

Behavioural changes in rats exposed to perinatal morphine

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Consequences of perinatal exposure to morphine (MO) was measured in rats. Pregnant female rats were treated daily with MO (10 mg/kg sc) until the 21th postpartum day. Spontaneous locomotor activity and behaviour in elevated plus maze was checked 48 hours, learning performance was measured two weeks after separation. The effect of MO(3 mg/kg) and Naloxone (NX) (1 mg/kg) on locomotor activity was also measured.
Results: 1. Perinatal exposure to MO significantly enhanced the locomotor activity in males. No change in the elevated plus maze behaviour was observed. Number of intertrial crosses was higher in the drug-exposed females. 2. MO induced long-lasting hyperlocomotion in controls but resulted in significantly shorter one in offspring exposed to perinatal MO. NX inhibited the locomotor activity in controls but failed to do it in MO-exposed offspring. The results indicate that animals exposed to perinatal MO lost their ability to adapt to novel sorroundings and their sensitivity toward opioid agonist and antagonist decreases.
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POSTER 223

Chronic Mild Stress Induces Depressive Behaviors in Adult but not Young Rats: Potential Role for AMPA Receptors

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Chronic mild stress in adult animals is known to induce depressive-like behaviors, but less is known about the long-term effects of chronic stress in young animals. In this study we compared the effect of 4 weeks of chronic mild environmental stressors in young (30 days) versus adult male rats on various behaviors (periods of food and/or water deprivation, cage tilt, change of cage mate, manipulations of access to circadian periods). We measured spontaneous locomotor activity in the home cage (Inframot system; TSE, Germany), explorative behavior in an open field, the forced swim test and other activities relevant to anhedonia, specifically the preference for sweet solutions and the sexual behavior. We have also compared expression of AMPA receptors within specific reward-related brain regions. The adult CMS animals visited the center of the open field less often than the controls indicating some increased anxiety. Chronic mild stress in adult rats induced a significant decrease in sucrose preference but had no such effect in young rats. The adult CMS male animals showed a significantly lower frequency of ejaculation behavior compare to the control group indicating some anhedonic expression in adult but not young CMS rats. In both group young and adult CMS showed an effect in the PFC, therefore the changes in GluR1 receptors cant account for the anhedonia induce by CMS. In the NAc GluR1 receptor level were altered only in the adult animals, this in effect may be implicated the anhedonic effect observed in adult, but not in young rat.
In conclusion, the present study demonstrate that CMS in the adult group causes decreases in male sexual behaviors and in sucrose preference, but no such difference was observed in the young group. Theses changes may correlate with alterations in GluR1 receptor levels in the NAc.

POSTER 224

The effect of acute stressors and rat strains on the genetic expression in the brain

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The aim of our research was investigation of the effect of stressors and genetic factors given by various rat strains on expression of immediate early genes. We used Sprague-Dawley and Lewis rat strains, the latter being known to have a deficient responsiveness of the hypothalamic-pituitary-adrenal (HPA) axis. The expression of two well-known markers of neuronal activity c-fos and Arc mRNA was determined in those brain areas that represent important parts of neuronal circuits activated by stress (prefrontal cortex, lateral

septum, nucleus paraventricularis (PVN), medial amygdala, locus coeruleus (LC). We also compared the dynamics and magnitude of expression of c-fos and Arc mRNA after application of immobilization stressor with different length of time (0.5 h; 1 h; 2 h; 4 h) by method of hybridization in situ. A strong induction of c-fos and Arc mRNA was observed already after 0.5 h of stress exposure in the tested areas, except PVN and LC where the expression of Arc mRNA was not present. The expression of c-fos mRNA significantly decreased in the groups exposed to stressor for 2 h or 4 h. On the contrary, there was no significant decrease of Arc mRNA expression observed in the groups exposed to the stressors for 2 h or 4 h in the most brain areas. Arc mRNA seems to be another alternative prominent marker of neuronal activity during stress and useful tool to study neuroplastic changes. When compared to Sprague-Dawley rats, Lewis rats showed significantly reduced expression c-fos mRNA. Our results amplified the knowledge of stressor specific response in the organism and the role of HPA axis.
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POSTER 225

Luminosity-dependent circadian modification of synaptic strength in the visual cortex of freely behaving rats

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Sensory experience induces changes in synaptic strength of the neurons in the primary visual cortex (V1). The physiological conditions that determine synaptic plasticity in freely behaving adult animals is a question which has not yet been addressed. Here, we offer the first evidence that basal synaptic transmission in V1 in freely moving animals is driven by luminosity conditions together with the visual experience of the animal.We recorded responses evoked in V1 through stimulation of the lateral geniculate nucleus for a period of 24h in freely moving male Long Evans rats. Prolonged exposure to low luminosity conditions (1-10lux, night conditions) decreased thalamocortical responses during test-pulse electrical stimulation, whereas prolonged light exposure (350-400 lux, daylight conditions) modified the field potentials in V1 towards potentiated levels. These circadian shifts conferred a sinusoidal profile to the naturally-occurring baseline in V1 and intrinsically altered the ability of the animal to express synaptic plasticity. Changes in synaptic strength variations have been reported in dark and light reared animals (Kirkwood, Nature 381:526-528). Our data demonstrate that synaptic strength in the visual cortex undergoes a cyclical variation which is driven by luminosity conditions in a 24h cycle. These changes can be mimicked by exposure to light and dark for brief periods independently of the circadian cycle. Luminosity–driven changes in synaptic strength, associated with the light-dark cycle, thus comprise a critical factor in the expression of synaptic plasticity capacity within the visual cortex.

POSTER 226

Unstable hippocampal place cell firing in rats with entorhinal cortex lesions

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Entorhinal cortex (EC) is the main source of cortical inputs to the hippocampus, a structure critically involved in spatial memory. To determine the interactions between these two structures, we recorded hippocampal place cells in EC-lesioned and control rats as they performed a pellet chasing task in a circular arena containing three object cues. EC lesions did not disrupt location-specific firing of place cells but some firing properties such as the field size, mean firing rate, in-field mean firing rate, and in-field peak firing rate were dramatically altered. We also examined the stability of place fields by recording place cells across successive sessions, in constant conditions or following cue manipulations (object rotation in the absence of the rat and object removal in the presence of the rat). In constant conditions , 39 % place fields in EC-lesioned rats were unstable, i.e. shifted position or stopped firing. No such unstable place fields were found in controls. Following cue manipulations, a large fraction of place cells in EC-lesioned rats did not exhibit coherent response. Object rotation did not yield equivalent field rotation in 43 % place cells and most fields were unstable after object removal. The results suggest that 1) location-specific firing of place cells does not exclusively depend on entorhinal inputs, 2) EC contributes to the formation and stability of hippocampal spatial representation, by processing sensory information and possibly providing a stable reference frame to the hippocampus.

POSTER 227

Reward-Expectancy Counteracts The Effects Of Chronic Social Stress On Behaviour And Hippocampal Synaptic Plasticity In Rats

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This study investigated the efficacy of reward-expectancy on counteracting the long-term consequences of chronic social stress in rats. It is known that chronic stress can lead to a generalised decrease in sensitivity to rewards (anhedonia) which is considered to be a core symptom of depression. Furthermore, it has been shown that chronic social stress in rats leads to an

impaired hippocampal synaptic plasticity. It is hypothesized that frequent induction of reward-expectancy counteracts these effects.
Defeated and subsequently isolated rats were subjected to regular reward-announcements during the long-term isolation-period. It became apparent that this treatment could prevent the development of anhedonia – as measured by the behavioural response in anticipation of a reward. However, it also appeared that this social-stress induced reward-insensitivity was only present when using a (5%)sucrose-solution and not when using environmental enrichment as a reward. It is hypothesised that this may be due to the rewarding and therapeutic value of the enrichment itself. To address this question and to investigate whether the expectancy-phase had an additional effect, socially stressed rats were subjected to a treatment of short-term exposures to an enriched cage and to half of the group the transfer to the enriched cage was announced. In addition to the parameters for reward-sensitivity, the synaptic plasticity of the hippocampus was investigated. It became apparent that regular transfer to an enriched cage could reverse the anhedonic state. And, importantly, the addition of an expectancy-phase had a supplementary effect on the restoration of the synaptic plasticity in the hippocampus

POSTER 228

Double deficiency for creatine kinases BCK and UbCKmit in mice implies inefficient brain energy metabolism: thermoregulation and behavioural stress

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Creatine kinases (CK) are enzymes important for cell energy metabolism. Cytosolic BCK and mitochondrial UbCKmit are mainly expressed in the brain, with BCK in neurons and astrocytes and UbCKmit in neurons. Mice deficient for BCK and UbCKmit (CK=/=, double knockout) demonstrate interesting changes:
Continuous lower body weight (smaller brain, smaller liver, shorter bones, less white adipose tissue) and reduced fat metabolism with lower blood values for glucose, leptin, free fatty acids, triglycerides, while caloric intake per gram body weight is increased.
Brain energy deficits became apparent following pentylenetetrazole-induced seizures (high energy demand) with CK=/= mice developing incomplete or no full-blown seizures (6 Hz synchronized discharge).
Previously, CK=/= mice demonstrated impaired spatial learning performance in the water maze and in a dry maze test, dramatically lower nest building activity, and diminished acoustic startle reflex responses (Streijger 2005).
Difficulty with keeping body temperature homeostasis was shown by cold stress-induced irreversible hypothermia and by daily temperature measurements. We are currently investigating whether unexpected changes in environment or routine, or other stressful events, induce body temperature drops (or heights) in CK=/= double knockout mice. This would confirm inefficient energy metabolism in the hypothalamic thermoregulation centre in CK=/= double knockout mice.

POSTER 229

Visual object processing and visual learning are linked within the hippocampus proper: an intracranial ERP study

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Empirical evidence demonstrated that the human hippocampus participates not only in episodic memory but also in visual object processing. However whether the hippocampus differentially contributed to distinct memory functions (early visual learning vs delayed recall and recognition) and whether and how this involvement was related to visual object processing is still unclear.
To this aim we recorded intracranial ERPs from within the hippocampus in 23 epilepsy patients, during a visual object decision task and related the pattern of neural activity to neuropsychological measures of visual learning and memory.
Hippocampal potentials discriminated between the two kinds of objects: while real objects elicited a pronounced positive component peaking between 500 and 900ms, nonsense figures elicited a marked negative potential in the same time-window. Moreover hippocampal responses to visual objects were found to correlate with visual learning scores at neuropsychological tests: the mean amplitude difference between hippocampal responses to real and nonsense objects in the time window between 500-900 ms correlated with learning in Trial 1 (r = .45) and visual learning capacity (r= .46): the higher the learning scores the higher the difference between neural response to real and nonsense objects. The correlations with delayed recognition scores were not significant. These data further demonstrate that the hippocampus is involved in the semantic processing of visual objects and suggest a dissociation within the hippocampus between related but distinct memory functions. Moreover the specific association between visual object processing and visual learning (and not delayed recognition) suggests a specific neuropsychological mechanism that may contribute to visual memory impairments in patients with hippocampal damage.

POSTER 230

Conscious and unconscious category adaptation in emotional faces

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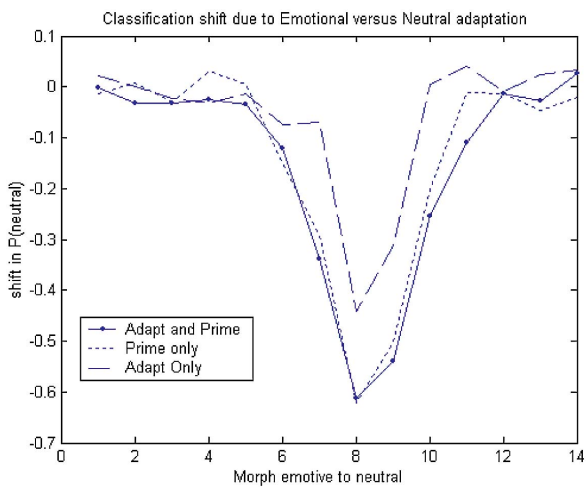
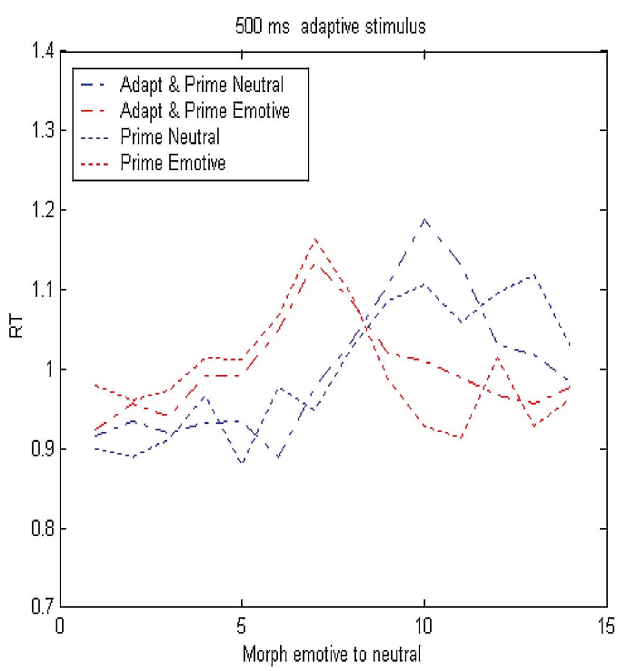
We describe the results of experiments investigating adaptation of categorical perception boundaries for emotional faces. We manipulated adaptation both with a pre-task adaptation phase and with a prime stimulus, which was either presented for 500 ms and consciously perceived, or for 22 ms and backward masked. We analyse the effects of the prime and of the adaptation phase and their interaction.



We replicate the findings of Webster (2004), but our data suggest that the adaptation of the category decision boundary is due to the superimposition of a perceptual and a task factor that produce separable effects also in the reaction time data.



In the Adaptation & Prime condition, 20 subjects performed forced choice categorization on 6 different stimuli morphed in 15 grades between neutral and emotional. Prior to the categorization task they were adapted to either a neutral or emotional endpoint over 2 min. Trials were in blocks with either short or long primes. 17 subjects saw the same stimuli in the same order without adaptation (prime only) and 19 with adaptation, but no prime

POSTER 231

Brain serotonergic neurons as a preferential target of BSE prions

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Psychiatric symptoms including depression, anxiety and insomnia are the earliest manifestations in variant Creutzfeldt-Jacob disease, the human form of bovine spongiform encephalopathy (BSE). Such deficits are evocative of disturbances of the brain serotonin system, which plays a key role in regulating mood and arousal. We studied the development of the pathophysiology in a mouse BSE model, using biochemical analysis and behavioural tests designed to evaluate serotonergic functions : circadian locomotor activity (photocell cages) anxiety-like behavior (light/dark box test) and pain sensitivity (hot plate test). The same tests were performed in mice subjected either to selective depletion of brain serotonin or lacking the prion protein. Mice infected intracerebrally with the BSE strain 6BP1 showed behavioral abnormalities developing at preclinical stage: changes in circadian activity,anxiolytic like behavior, hyperalgesia and exaggerated stereotypies aftet injection of a serotonin agonist (serotonin syndrome). The earliest signs of serotonin dysfunction appear to involve a loss of function of the normal prion protein PrPc, detected at 1/3 incubation time, well before accumulation of PrPres and onset of motor clinical symptoms.

These results demonstrate that the serotonergic system is a preferential target of the BSE agent. We propose that early PrPc dysfunction affects the homeostasis of serotonergic neurons, which would constitute a primary step in the neurodegenerative process. Our findings suggest the possibility of neuroprotective tooltargeting the brain serotonin system for prophylaxis of human prion diseases at early clinical stage.

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POSTER 232

Antidepressant effect of nicotine

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Depression is a heterogeneous chronic disorder often manifested with symptoms at the psychological, behavioural and physiological levels with a prevalence as high as 21% of the general population in some developed countries. The prevalence of nicotine dependence in patients with major depression ranges from 50-60%. Smokers with a history of depression are also two to three times more likely to have failed smoking cessation attempts compared to dependent smokers without a history of major depression. Smoking cessation induces depressive-like symptoms and transdermal nicotine patches improve mood and increases REM sleep in nonsmoking patients with major depression. The neurobiological basis of this association is not clear, it has been suggested that smoking is a self-medication effort made by the depressed individual to alleviate some symptoms of depression by using nicotine. The objective of this work was to study the possible antidepressant effect of ingested nicotine in depressive rats by olfactory bulbectomy (BR). To evaluate the degree of depression we used the forced swim test where depressive rats show higher levels of immobility which is reverted by antidepressives. Locomotory activity was evaluated by the open field test. The rats had free election to choose one bottle with tap water or another with nicotine diluted in tap water the 24 hours of the day . Nicotine self-administration was higher in BR than sham rats (SR) which resulted in a significant reduction of immobility time in the swim test in BR but not in SR. In the open field test BR had locomotor activity similar to SR. In conclusion, nicotine intake by depressive rats is higher, showing antidepressive effects according to the forced swim test. Moreover behavior of BR becomes similar to SR. These results suggest that nicotine has therapeutic benefits in depression. Further studies need to be done with rats addicted to nicotine so as to understand some molecular mechanism.

POSTER 233

Modulation of hippocampal synaptic plasticity by various patterns of Amygdala Stimulation

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Stress can impair or facilitate learning and memory. The amygdala plays an important role in emotional arousal and is believed to be involved in the twofold effects of stress. Previous studies indicated that activation of the amygdala by emotional or electrical stimulation modulates hippocampal dependent memory processes and synaptic plasticity. Although the modulatory effect of the amygdala has often been generalized to the hippocampal formation, studies suggest that hippocampal subregions may display distinct functional profiles and may respond distinctively to amygdala activation. In this study, we assessed the effect of various patterns of basolateral amygdala (BLA) activation on long-term potentiation (LTP) -a synaptic model of memory- at the perforant path (PP)–dentate gyrus (DG) and the ventral hippocampal commissure (vHC)-CA1 synapses, in anesthetized rats. The modulatory stimulations, high or low frequency stimulations (HFS or LFS) were applied to the BLA 30 s prior LTP induction. Results show that a 100 Hz (50 pulses) HFS protocol, as well as a 1 Hz (900 pulses) LFS protocol enhanced LTP in DG but impaired CA1 LTP. In contrast, a 1 Hz (50 pulses) LFS protocol impeded LTP in DG but not in the CA1.

These findings provide evidence for a differential amygdalar control of hippocampal memory subsystems, and may contribute to the understanding of the complexity of memory processes under stressful conditions.

POSTER 234

Lexico-semantic processing across different visual forms: fMRI evidence from native signers of British Sign Language

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Lexical meaning can be expressed through various visual forms. These include written words, pictures and, for those who use a signed language, signs (SL) and fingerspelling (FS). The aim of the present study was to investigate the neural systems involved in lexico-semantic processing using fMRI. Activation patterns during perception of different visual forms were compared in Deaf native signers of British Sign Language (BSL) and hearing participants with no knowledge of SL or FS, who viewed these stimuli as meaningless gesture. The rationale was to identify linguistic and non-linguistic contributions to networks of activation, as well as differences related to input form. Right-handed volunteers underwent fMRI scanning while viewing lists of concrete nouns presented as different visual forms (written words, pictures, SL, FS). Patterns of activation evident for meaningful linguistic gesture (SL and FS) in signers could be distinguished from those for non-signers, specifically: left superior temporal cortex and left posterior inferior temporal regions (including the region often identified as the visual word form area in studies of reading) were activated more strongly in signers than non-signers by both SL and FS. Further group and task results will be reported.

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POSTER 235

The Constancy Effect of selective attention: Testing the influence of perceptual load and spatial competition on velocity perception.

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Selective visual attention is known to improve processing of attended stimuli in a competition-dependent manner. However, at the neuronal level it is not yet clear how an increase in competition causes an increase of attentional effects. Recent neurophysiological data [Wegener et al., J Neurosci, 2004] demonstrated that attention serves to (1) keep neuronal selectivity on a high and constant level

and (2) to protect selectivity within the attentional focus against degradation, as observed for neurons processing competing, non-attended objects.
Although there is some evidence that neuronal activity in area MT is strongly related to motion perception, it is not yet clear, whether the observed neurophysiological effects have a direct perceptual correlate. Additionally, in our former study we only tested the effect of increasing spatial competition, but we did not vary perceptual load. To investigate the relation between inter-stimulus competition and perceptual accuracy we therefore employed a Posner paradigm, in which participants were asked to detect a change in the velocity of one out of two or four moving bars presented at varying spatial distances. In close correspondence to the neurophysiological data we find that for all stimulus conditions tested detection accuracy stays constant for the attended object compared to the performance in a single bar experiment without competition. The major competition-dependent change occurred for non-attended bars for which detection accuracy decreased with increasing inter-stimulus competition or higher perceptual load. This suggests that in order to ensure an optimal representation of the attended content attention shields the representation against modulation from non-attended, interfering objects. Thus, a major task of attention is to guaranty "representation constancy" with increasing perceptual load.

POSTER 236
Bimanual estimation of length: a fMRI study
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Many studies both in monkey and in human have shown that several areas of the Posterior Parietal Cortex are involved in visuospatial tasks. In the present study, we aimed to investigate brain areas involved in the coordinate transformation without visual feedback, comparing the hemodinamic changes during active estimation of line length with they due to a simple bimanual ballistic task .The fMRI study was carried out using a 1.5 T Philips Gyroscan Intera imager and EPI technique. Nine informed healthy male volunteers were asked to view a milky screen, where versions of Muller-Lyer visual stimuli were projected. Muller Lyer Illusion was chosen because It strongly affects the judgement of lines length. In a first condition (perceptual report), subjects had to lift their arms when they perceived the lines length as different. In the second condition (motor response), they had to respond to line length by lifting and appropriately spacing their arms. Data pre-processing (image realignment, normalization and smoothing) and statistical analysis of significant relative regional BOLD response changes were performed using SPM2 software (Wellcome Department of Cognitive Neurology, London, Uk).
Collected data confirm behavioural observations reported in previous studies using the Muller-Lyer illusion and show different activation of occipito-temporal and occipito-parietal regions in the two situations. Present findings provide new evidence and further detail the involvement of the posterior cerebral cortex in size estimation and coordinate transformation processing.

POSTER 237
Cognitive organization of relevant and irrelevant spatial information does not require commissural communication between the two hippocampi or hemispheres
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We developed place avoidance tasks for rats to measure dynamic cognitive organization of relevant and irrelevant information. In the key "Room+Arena-" task, a rat on a continuously rotating (1 rpm) arena must avoid foot-shock in place using the relevant distal room cues and ignore the irrelevant local cues that rotate with the arena. Injecting tetrodotoxin (TTX) into one hippocampus selectively abolished Room+Arena- avoidance (Wesierska et al., 2005, JNsci: 25:2413) indicating the TTX injection abolished the cognitive organization of relevant and irrelevant stimuli. Permanent neurotoxic or electrolytic lesions of one hippocampus spared Room+Arena- learning but performance was less accurate than in intact rats indicating the TTX-impairment was not merely due to inadequate numbers of active neurons. Another explanation for the TTX-impairment is that concurrent activity in the two hippocampi is necessary for Room+Arena- avoidance. We therefore compared the effects of split brain and hippocampal disconnection. Rats in groups with cut corpus callosum CC (n= 13) or cut ventral hippocampal commissure VHC (n=12) were trained for 6 days. Learning was measured by the number of entrances of the to-be-avoided place and the maximum time avoided. Learning was asymptotic by day 4. The CC and VHC rats made fewer entrances than rats with permanent unilateral hippocampal lesions. The data indicate that the TTX-impaired cognitive organization of relevant and irrelevant information was not merely due to abolished commissural communication between the hippocampi or neocortex.
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POSTER 238
Prefrontal cortical activity during eyeblink conditioning and subsequent cooling of the interpositus nucleus in rabbit
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In rabbit eyeblink conditioning, a temporal model of learning-related activity predicting the learned behavioral eyeblink response has been observed in various brain regions. So far, when tested, this template, as well as learned behaviour, has been dependent on the functioning of the cerebellar interpositus nucleus (IPN). In this study, we recorded multi-unit activity (MUA) in the medial prefrontal cortex (mPFC) both during training and, after fulfillment of the learning criterion, during cooling of the IPN. The results showed that (i) the template of learning-related activity was present in the mPFC, (ii) this template, together with the learned behaviour, disappeared during cooling of the IPN, and (iii) the mPFC template and the learned behavior returned when cooling was terminated. Together with previous studies this result supports the

central role of the IPN in eyeblink conditioning. Most likely learning in places like the mPFC build on IPN learning. Previous research suggests that mPFC is importantly involved in emotional perception and learning. The relation between emotions in mPFC and simple associative learning in IPN encourages further exploration.

POSTER 239

Attention related beta activity in the lateral-posterior nucleus of the cat

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The local field potentials from different visual cortical areas and subdivisions of cat's lateral posterior-pulvinar complex of the thalamus (LP-P) were recorded during behavioural task based on delayed spatial discrimination of the visual or auditory stimuli. During visual but not auditory attentive situation we observed an increase of spectral power within beta band (14-24Hz) as calculated from signals recorded from the caudal part of the lateral zone of LP-P (LPl-c) as well as from cortical areas 17, 18 and PMLS. This beta activity appeared only in the trials that ended with a successful response, proving its relation to the mechanism of visual attention. In contrast, no enhanced beta activity was observed in the rostral part of lateral zone of LP-P (LPl-r) and in pulvinar proper.
The attention related activity recorded in area 17 and the ventromedial part of LPl-c was in the beta 1 range (13-18 Hz) whereas beta 2 (18-24 Hz) characterized recordings from area 18 and the dorsolateral subdivision of LPl-c. Our observations indicate that LPl-c belongs to the wide cortico-thalamic attentional system which carries two segregated streams of visual information with presumably different functions.
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POSTER 240

Concurrent TAL: aversive processing via capsaicin-sensitive vagal afferent fibres

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Taste aversion learning (TAL) is a type of learning characterized by rejection of a gustatory stimulus as a consequence of its pairing with visceral discomfort and malaise. TAL can be established in the laboratory following a concurrent procedure in which two flavoured stimuli are offered at the same time in each session for several minutes; the ingestion of one flavour is associated with the simultaneous intragastric administration of an aversive substance, whereas ingestion of the other is associated with an innocuous product. Thus, in this modality of TAL the animal must detect and process the visceral stimulus very rapidly for it to be associated with one of the two flavour stimuli.
Previous studies with vagotomized or medullary afferent vagal axotomized animals demonstrated the involvement of the vagus nerve in concurrent TAL. The aim of this study was to examine the role of capsaicin-sensitive vagal afferent fibres in this modality of TAL in rats. Capsaicin (8-methyl-N-vanillyl-6-nonenamide) is a neurotoxin that selectively destroys weakly myelinated A-delta or unmyelinated C afferent fibres, and it has been shown that around 99% vagus abdominal afferents are unmyelinated C-fiber. In this experiment, the neurotoxin was applied perineurally on the oesophagus in the subdiaphragmatic region. After one week of recovery, the animals (control and capsaicinized) were given a choice of two flavours (strawberry and coconut) for 7 minutes. The ingestion of one flavour was paired with simultaneous intragastric administration of hypertonic sodium chloride (NaCl) and the other flavour with physiological saline. This experimental procedure was prolonged over three trials. In agreement with previous studies in vagotomized or afferent axotomized animals, the results showed that perivagal administration of capsaicin blocked acquisition of concurrent TAL. In contrast, control animals effectively learned to avoid the flavour associated with hypertonic NaCl.

POSTER 241

Morphine-induced amnesia in morphine-sensitized rats: role of the ventral tegmental area (VTA)

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Neuropharmacological investigations demonstrate that morphine elicits its reinforcing properties at the level of the ventral tegmental area (VTA). In the present study, the effects of intra-VTA injections of morphine on memory retention of a one-trial passive avoidance task have been investigated in morphine-sensitized rats. In these experiments, Male Wistar rats weighing 250-300 g at the time of surgery were used. Animals were canulated in right and left VTA by stereotaxic instrument. The retrieval was examined 24 hour after training and used as memory retention. Sensitization was obtained by subcutaneous (s.c.) injections of morphine, once daily for three days and five days free of the opioid before training. Post-training administration of the systemic (2.5, 5 and 7.5 mg/kg, s.c.) of morphine, dose-dependently induced amnesia. In order to show the role of the VTA in the morphine-induced impairment of memory retention, morphine (5 and 7.5 mg/rat) has been injected in this site. The bilateral intra-VTA injections of morphine impaired memory retention. The response induced by post-training administration of intra-VTA morphine (7.5 mg/rat) was significantly reversed in morphine-sensitized rats. The inhibition of morphine-induced amnesia in morphine-sensitized rats was decreased by once daily injections of naloxone (0.5, 1 and 2 mg/kg, s.c.). The results suggest that VTA has an important role in morphine-induced amnesia and morphine sensitization affects this process through opioid receptors.
Keywords: Morphine; Ventral tegmental area; sensitization; Naloxone; Passive avoidance learning; Rat

POSTER 242

Influence of differential housing on emotional behaviour and neurotrophin levels in mice

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Background: Environmental enrichment condition (EC) has been demonstrated to induce profound behavioural, neurochemical and neuroanatomical changes in the brain. Increasing evidence has shown that the hippocampus is one of the most susceptible brain areas to effects of enriched rearing and is implicated in a range of cognitive functions, including learning and memory. But less is known about the impact of enrichment on hippocampus related emotional behaviour. Recent studies also suggest that the hippocampus is functionally segregated; lesion studies have shown that the dorsal hippocampus is important for spatial learning, whereas the ventral part is critical in emotional behaviour in rats. However, it is unknown how these two hippocampal regions respond to EC.

Methods: In this study we investigated the effects of differential housing environments on anxiety related behaviour and neurotrophin levels in dorsal and ventral hippocampus, and other brain regions. Ninety-six male and female C57BL/6 mice were reared in EC or standard housed condition (SC) from weaning at 21 days old for 4 months. After differential housing, sixty-four animals were tested in the elevated plus-maze, open-field, novel-objects exploration and food neophobia. Thirty-two animals remained as untested. Subsequently brain nerve growth factor (NGF) and brain-derived neurotrophic factor (BDNF) were analysed in selected brain regions.

Results: We found that the normal (steady state) levels of BDNF and NGF protein are differently distributed in dorsal and ventral parts of hippocampus in both male and female mice, with the dorsal hippocampal levels being consistently higher than those in ventral hippocampus. In comparison with untested subjects, exposure to behavioural testing induced complex changes on neurotrophin levels in selected brain regions. Differential housing exerted significant influences on anxiety-related behaviour and brain neurotrophins; and these changes were sex and brain region dependent

Conclusion: This study demonstrates for the first time the differential distribution of normal levels of neurotrophin protein in dorsal and ventral hippocampi in mice. Our results also show that environmental manipulation can induce changes in neurotrophin levels in discrete brain regions which can impact on emotional behaviour

POSTER 243

The inhibitory components in the Sustained Attention to Response Task.

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The present study investigated the inhibitory event related potentials (ERPs) component in the Sustained Attention to Response Task (SART). The SART is a go/no-go task in which the no-go target appears unpredictably and rarely. Stimuli consisted of digits (from 1 to 9) displayed in the centre of the screen. Subjects were required to respond to the digits with a key press with the exception of the number 3 which requires no response. The paradigm, introduced by Robertson et al. (1997), is considered a measure of sustained attention, but it clearly involves also inhibitory mechanisms. In the present experiment, the EEG was recorded from 58 electrodes including horizontal and vertical EOG, with mastoids as reference. The results are consistent with the literature (Bokura H., Yamaguchi S., Kobayashi S., 2001, Falkenstein M., Hoormann J., Hohnsbein J. , 1999) on the go/no-go task: N1, N2 and P3 were reported. N2 was the only component that reached a consistent amplitude in the no-go trials and it was not recorded in the go trials. Moreover data clearly show a lateralization of the registered ERPs components to the right hemisphere. Results suggest that the SART activates a lateralized N2 potential, a specific component associated with the withholding of a motor response. N2 could be interpreted as an index of an inhibitory mechanism or as an index of the process of resolution of response conflict.

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POSTER 244

Comparison of animate contours processing in visual areas 17,18 and 21a of the cat.

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It has been previously shown that cortical areas 17 and 18 in cats (Redies et al, Exp. Brain Res., 5: 469, 1986) and in monkeys (von der Heydt and Peterhans, J. Neurosci., 1989; 9: 1731) encode information of complex shapes compared to conventional stimuli such as bars and gratings. The highest processes of recognition of complex visual images in monkeys are taking place in temporal areas (Gross et al, 1969; Science, 166: 1303), and we have hypothesized that in cats the temporal area 21a may represent its functional ana-

log. We have studied processing of complex shapes, such as animate contours (AC- cat's whole body contours), in single complex cells in areas 17, 18 and 21a of paralyzed and anesthetized cats, presented monocularly and repeatedly to the same eye within the cell's receptive field. These were compared to various degraded and scrambled ACimages and ellipses. Responses to ACwere stronger as compared to ellipses ($p<0.05$; W-paired test) and lines ($p<O.Ol$) in all three visual areas. Scrambling and degradation of the AC image as well, remarkably influenced the cells' responsiveness in areas 17, 18 and 21a. It has been concluded that visual cortex cells are capable to code complex images at each of the level studied. The coding capability of area 17 cells is broader than expected on the basis of previous studies on the responsiveness of this area to geometric features. Area 18 and especially 21a cells contribute more to complex image processing; however, we didn't find there cells that are comparable to those in the temporal cortex of monkeys.

POSTER 245

Observation of transient neural dynamics in the rodent hippocampus during behavior of a sequential decision task using predictive filter methods

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Encoding describes a process that transforms stimulus information into neural activity. In contrast, decoding uses inference to estimate sensory, motor or cognitive representations and processes based on neural activity. A variety of decoding measures have been developed and validated via correlation between observed behavioral variables and neural activity; however, the assumptions of decoding models often obscure observation of processes which do not occur on the timescale of predicted behavioral variables. Decoding methods usually make implicit behavioral timing assumptions that limit predictions of behavioral variables to the order of seconds.

In order to examine dynamics of neural representations at shorter timescales, we modified a recursive Bayesian decoding model (Brown et al., 1998) to include network-dependent state-transition prior distributions using predictive filter methods. This allows explicit examination of integration of past and current spike data used in recursive estimation. These spatiotemporal continuity conditions provide a well established method to examine transient dynamics even at fine timescales.

Based on this modification, we examined changes in hippocampal representation at millisecond resolution. Preliminary observations suggest directional spatial flow patterns associated with task performance consistent with observations of phase precession. Observed patterns of neural activity also suggest internally consistent, non-local replay during periods of awake behavior, not unlike patterns of activity associated with route replay during slow wave sleep. Because state-transition prior distributions are also mathematically similar to models of functional hippocampal network connectivity, they may provide quantitative representation methods to test network connectivity within the awake, behaving animal.

POSTER 246

Neurophysiological correlates of self-face recognition

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Research on the perception and recognition of one's own face is relatively new and includes mixed reports that the left hemisphere (Turk et al., 2002; Nat.Neuro, 5, 841-842) and that the right hemisphere (Keenan et al., 2001 Nature, 409, 305) is dominant for self-recognition. We investigated ERP correlates of face recognition using a task where twelve participants monitored a sequence of images for repetitions. The stimuli included images of unfamiliar faces, highly familiar faces (participants' own faces and the faces of friends), and non-faces (flowers). The ERPs showed characteristic early positive (P110) and negative (N170) peaks at both occipital and temporal sites, the N170 amplitude being significantly greater for faces than non-faces and more marked over the right (T6) than the left (T5) hemisphere. While these early components of the ERP did not differ between unfamiliar and familiar other faces, ERPs to familiar other faces showed greater negativity at later time periods (~450-600 ms). Finally, a comparison of the ERPs to familiar other and to one's own face showed increased negativity to self-faces at both early (~250ms) and later (~450-600 ms) time periods. The differences we find in the 'self' and 'other' conditions are discussed in terms of possible familiarity effects and in light of recent proposals that the self-recognition system is part of a broader, right hemisphere based 'mirror' system.

POSTER 247

Shared or separate mechanisms for self-face and other-face recognition?

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Recent studies from brain imaging, clinical neuropsychology and experimental psychology conclude that separate neural processes underlie the recognition of our own face and the faces of other people. However, several of these studies also suggest shared or common mechanisms. In this study we use an adaptation paradigm to investigate the extent to which common or separate processes underlie the perception of self- and other-faces. Sixteen participants rated original and distorted photographs of faces (their own, that of a close friend, and a stranger face) for normality and attractiveness both before and after a five minute period of adaptation to a set of distorted stranger faces. The adapting faces were either compressed or expanded to the maximum level of distortion, and the test faces were compressed or expanded to different degrees (from minimum to maximum distortion). Adaptation to compressed (expanded) stranger faces led to significant aftereffects

whereby compressed (expanded) stranger faces were judged more normal and attractive, and expanded (compressed) faces appeared less so. In particular, we obtained aftereffects of comparable extent and magnitude for 'self' and 'friend' faces after adapting to stranger faces. We are currently testing with the reverse procedure. To date our research suggests that the perceptual mechanisms involved in the judgement of facial shape and attractiveness are common to self and other faces.

POSTER 248

Delayed search for a social and a non-social goal object by the young domestic chick (Gallus gallus)

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Five-day-old chicks were trained in a delayed-response task. Each chick was placed in a wide circular arena, within a starting box made of clear glass, and was required to rejoin a goal-object made to disappear behind one of two identical screens symmetrically positioned within the arena. The delays could be of either 10, 30, 60, 120 or 180 seconds. Twenty consecutive trials were administered to each chick and in each trial the object could be made to disappear randomly behind either screen. Two different goal objects were used: an artificial social companion (an imprinting red ball) or a palatable food item (a live mealworm). In exp. 1 (N=138) the two screens remained visible throughout the delay time (the chick was confined at the starting point behind a transparent partition and could see the correct as well as the incorrect screen). Under this condition, with both goal objects chicks proved capable of remembering and choosing the correct screen above chance level at all retention intervals; however, chicks were better at finding the social object than the food item. In exp. 2 (N=112) chicks were confined behind an opaque partition thoroughly preventing the sight of the correct, as well as that of the incorrect screen during the delay. Chicks still scored well above chance level at all retention intervals even in exp. 2, when the visibility of the screens was prevented during the delay, though there was a slight decline in performance. Once again, the performance with the social attractor was better than with the food item, but overall above chance for both goal objects. These findings thus reveal that domestic chicks have striking abilities to remember the location of biologically relevant objects, even after quite a long time from their disappearance from sight; such abilities can parallel those of most mammals.

POSTER 249

Individual traits related to anxiety and social adaptation of male rats in the diving-for-food paradigm

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The diving-for-food situation is a complex social task that consists of rats swimming in apnea to reach food through a fully immersed swimming pool, bringing a pellet back to the cage and eating it. The progressive immersion of the way of access to the feeder induces the emergence of a social differentiation in a group of 6 rats between the Carriers who dive and swim to get food, and the Non-Carriers who never dive and get their food only by stealing it from Carriers. Previous results demonstrated a role for anxiety towards the water constraint and the social context in the acquisition of the Carrier profile. In the present study, we hypothesized that Carriers could be differentiated from the Non-Carriers on the basis of individual traits related to anxiety. For this purpose, sixty Wistar male rats were assessed for their level of anxiety in the elevated plus-maze before and after exposure to the diving-for-food situation. Based on the time spent in the open arms, rats were divided into 6 subgroups (10 rats/group) corresponding to 6 different levels of anxiety from the lowest (LAL) to the highest (HAL). Then, 10 groups of 6 rats each were formed, including one rat from each level of anxiety, and were subjected to the social test. When the Carrier/Non-Carrier differentiation has been established, i.e. one month later, the rats were tested in the plus-maze. Results showed that the major part of the LAL and HAL rats became Carriers and Non-Carriers, respectively. Compared with the initial level of anxiety, the HAL rats appeared to be less anxious after the diving-for-food experiment whereas the opposite, i.e., a significant increase of the anxiety level, was observed in LAL rats. In conclusion, a relationship was observed between anxiety level and Carrier/Non-Carrier status, indicating that individual differences of anxiety can be predictive of social behavior. The results also suggest a role for anxiety in the adaptation of individual behaviors to the social context.