

Andrew Barron
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Biography

Dr Barron is an Australian Research Council Future Fellow, and Deputy Head of the Department of Biological Sciences at Macquarie University. He is a neuroethologist, which is a discipline of neuroscience studying the neural mechanisms of natural animal behaviour. Most of his research focuses on insects, especially honey bees. Using advanced techniques to visualise, manipulate, map and record from the insect brain Barron's team has made important contributions to the understanding of fundamental behavioural systems such as cognition, navigation, social behaviour and learning and memory.

He also conducts research to improve honey bee health and welfare. He is studying how bees and bee colonies are impacted by pesticide and disease stressors, and how to best intervene to help bee colonies under stress.

Employment

Professor

Professor
School of Natural Sciences
Macquarie University
1 Jan 2022 → present

Australian Research Council Future Fellow

Australian Research Council
Canberra, Australia
1 Jan 2015 → present

President, Australasian Society for the Study of Animal Behaviour

AUSTRALASIAN SOCIETY OF THE STUDY OF ANIMAL BEHAVIOUR
Australia
1 Jan 2012 → 1 Jan 2014

Vice-President, Australasian Society for the Study of Animal Behaviour

AUSTRALASIAN SOCIETY OF THE STUDY OF ANIMAL BEHAVIOUR
Australia
1 Jan 2010 → 1 Jan 2012

Treasurer, Australasian Society for the Study of Animal Behaviour

AUSTRALASIAN SOCIETY OF THE STUDY OF ANIMAL BEHAVIOUR
Australia
1 Jan 2008 → 1 Jan 2010

Postdoctoral Fellow, Research School of Biological Sciences

Australian National University
Canberra, Australia
1 Jan 2004 → 1 Jan 2007

Fullbright Postdoctoral Fellow

University of Illinois at Urbana-Champaign
Champaign, United States
1 Jan 2001 → 1 Jan 2004

Royal Society Postdoctoral Fellow

University of Sydney

2006, Australia

1 Jan 1999 → 1 Jan 2001

Research output

The best of both worlds: dual systems of reasoning in animals and AI

Kelly, M. & Barron, A. B., Aug 2022, In: *Cognition*. 225, p. 1-9 9 p., 105118.

Honey bees cannot sense harmful concentrations of metal pollutants in food

Monchanin, C., Gabriela de Brito Sanchez, M., Lecouivre, L., Boidard, O., Méry, G., Silvestre, J., Le Roux, G., Baqué, D., Elger, A., Barron, A. B., Lihoreau, M. & Devaud, J. M., Jun 2022, In: *Chemosphere*. 297, p. 1-9 9 p., 134089.

The involvement of a floral scent in plant-honeybee interaction

Liu, Y. B., Zeng, Z. J., Barron, A. B., Ma, Y., He, Y. Z., Liu, J. F., Li, Z., Yan, W. Y. & He, X. J., Jun 2022, In: *Science of Nature*. 109, 3, p. 1-10 10 p., 30.

Extent and complexity of RNA processing in honey bee queen and worker caste development

He, X. J., Barron, A. B., Yang, L., Chen, H., He, Y. Z., Zhang, L. Z., Huang, Q., Wang, Z. L., Wu, X. B., Yan, W. Y. & Zeng, Z. J., 20 May 2022, In: *iScience*. 25, 5, p. 1-19 19 p., 104301.

Evaluating the foraging performance of individual honey bees in different environments with automated field RFID systems

Colin, T., Warren, R. J., Quarrell, S. R., Allen, G. R. & Barron, A. B., May 2022, In: *Ecosphere*. 13, 5, p. 1-15 15 p., e4088.

EchoVPR: Echo State Networks for visual place recognition

Ozdemir, A., Scerri, M., Barron, A., Philippides, A., Mangan, M., Vasilaki, E. & Manneschi, L., Apr 2022, In: *IEEE Robotics and Automation Letters*. 7, 2, p. 4520-4527 8 p.

Non-additive gene interactions underpin molecular and phenotypic responses in honey bee larvae exposed to imidacloprid and thymol

Paten, A. M., Colin, T., Coppin, C. W., Court, L. N., Barron, A. B., Oakeshott, J. G. & Morgan, M. J., 25 Mar 2022, In: *Science of the Total Environment*. 814, p. 1-11 11 p., 152614.

Traces of a neonicotinoid pesticide stimulate different honey bee colony activities, but do not increase colony size or longevity

Meikle, W. G., Colin, T., Adamczyk, J. J., Weiss, M. & Barron, A. B., Feb 2022, In: *Ecotoxicology and Environmental Safety*. 231, p. 1-8 8 p., 113202.

Did prosociality drive the evolution of homosexuality? Response to Luoto (2021)

Barron, A. B., Oct 2021, In: *Archives of Sexual Behavior*. 50, 7, p. 2781-2783 3 p.

Current permissible levels of metal pollutants harm terrestrial invertebrates

Monchanin, C., Devaud, J. M., Barron, A. B. & Lihoreau, M., 20 Jul 2021, In: *Science of the Total Environment*. 779, p. 1-8 8 p., 146398.

A model of resource partitioning between foraging bees based on learning

Dubois, T., Pasquaretta, C., Barron, A. B., Gautrais, J. & Lihoreau, M., Jul 2021, In: *PLoS Computational Biology*. 17, 7, p. 1-19 19 p., e1009260.

Metal pollutants have additive negative effects on honey bee cognition

Monchanin, C., Drujont, E., Devaud, J-M., Lihoreau, M. & Barron, A. B., Jun 2021, In: *Journal of Experimental Biology*. 224, 12, p. 1-7 7 p., jeb241869.

Chronic exposure to trace lead impairs honey bee learning

Monchanin, C., Blanc-Brude, A., Drujont, E., Negahi, M. M., Pasquaretta, C., Silvestre, J., Baqué, D., Elger, A., Barron, A. B., Devaud, J. M. & Lihoreau, M., 1 Apr 2021, In: *Ecotoxicology and Environmental Safety*. 212, p. 1-9 9 p., 112008.

Effects of late miticide treatments on foraging and colony productivity of European honey bees (*Apis mellifera*)

Colin, T., Forster, C. C., Westacott, J., Wu, X., Meikle, W. G. & Barron, A. B., Apr 2021, In: *Apidologie*. 52, 2, p. 474-492 19 p.

Non-numerical strategies used by bees to solve numerical cognition tasks

MaBouDi, H., Barron, A. B., Li, S., Honkanen, M., Loukola, O. J., Peng, F., Li, W., Marshall, J. A. R., Cope, A., Vasilaki, E. & Solvi, C., 24 Feb 2021, In: *Proceedings of the Royal Society B: Biological Sciences*. 288, 1945, p. 1-10 10 p., 20202711.

Effects of commercial queen rearing methods on queen fecundity and genome methylation

Yi, Y., Liu, Y.-B., Barron, A. B. & Zeng, Z.-J., Feb 2021, In: *Apidologie*. 52, 1, p. 282-291 10 p.

Pesticide dosing must be guided by ecological principles

Colin, T., Monchanin, C., Lihoreau, M. & Barron, A. B., Dec 2020, In: *Nature Ecology and Evolution*. 4, 12, p. 1575-1577 3 p.

Transcriptomic, morphological, and developmental comparison of adult honey bee queens (*Apis mellifera*) reared from eggs or worker larvae of differing ages

Yi, Y., Liu, Y. B., Barron, A. B. & Zeng, Z. J., Dec 2020, In: *Journal of economic entomology*. 113, 6, p. 2581-2587 7 p.

Transgenerational accumulation of methylome changes discovered in commercially reared honey bee (*Apis mellifera*) queens

Yi, Y., He, X. J., Barron, A. B., Liu, Y. B., Wang, Z. L., Yan, W. Y. & Zeng, Z. J., Dec 2020, In: *Insect Biochemistry and Molecular Biology*. 127, p. 1-11 11 p., 103476.

Response to Luoto's (2020) "Did Prosociality Drive the Evolution of Homosexuality?"

Barron, A. B., Oct 2020, In: *Archives of Sexual Behavior*. 49, 7, p. 2245-2246 2 p.

Honeybees solve a multi-comparison ranking task by probability matching

MaBouDi, H., Marshall, J. A. R. & Barron, A. B., 9 Sep 2020, In: *Proceedings. Biological sciences*. 287, 1934, p. 1-9 9 p., 20201525.

Vertical lobes of the mushroom body are essential for view-based navigation in Australian *Myrmecia* ants

Kamhi, J. F., Barron, A. B. & Narendra, A., 7 Sep 2020, In: *Current Biology*. 30, 17, p. 3432-3437 9 p.

The miticide thymol in combination with trace levels of the neonicotinoid imidacloprid reduces visual learning performance in honey bees (*Apis mellifera*)

Colin, T., Plath, J. A., Klein, S., Vine, P., Devaud, J. M., Lihoreau, M., Meikle, W. G. & Barron, A. B., Aug 2020, In: *Apidologie*. 51, 4, p. 499-509 11 p.

A hybrid compact neural architecture for visual place recognition

Chancan, M., Hernandez-Nunez, L., Narendra, A., Barron, A. B. & Milford, M., Apr 2020, In: *IEEE Robotics and Automation Letters*. 5, 2, p. 993-1000 8 p.

Prosociality and a sociosexual hypothesis for the evolution of same-sex attraction in humans

Barron, A. B. & Hare, B., 16 Jan 2020, In: *Frontiers in Psychology*. 10, p. 1-7 7 p., 2955.

First-person interventions and the meta-problem of consciousness

Klein, C. & Barron, A. B., 2020, In: *Journal of Consciousness Studies*. 27, 5-6, p. 82-90 9 p.

How experimental neuroscientists can fix the hard problem of consciousness

Klein, C. & Barron, A. B., 2020, In: Neuroscience of Consciousness. 6, 1, p. 1-10 10 p., niaa009.

The capping pheromones and putative biosynthetic pathways in worker and drone larvae of honey bees *Apis mellifera*

Qin, Q-H., He, X-J., Barron, A. B., Guo, L., Jiang, W-J. & Zeng, Z-J., Dec 2019, In: Apidologie. 50, 6, p. 793-803 11 p.

Long-term dynamics of honey bee colonies following exposure to chemical stress

Colin, T., Meikle, W. G., Paten, A. M. & Barron, A. B., 10 Aug 2019, In: Science of the Total Environment. 677, p. 660-670 11 p.

Traces of a neonicotinoid induce precocious foraging and reduce foraging performance in honey bees

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A maternal effect on queen production in honeybees

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A comparison of honeybee (*Apis mellifera*) queen, worker and drone larvae by RNA-Seq

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Honey bees increase their foraging performance and frequency of pollen trips through experience

Klein, S., Pasquaretta, C., He, X. J., Perry, C., Søvik, E., Devaud, J. M., Barron, A. B. & Lihoreau, M., 1 May 2019, In: Scientific Reports. 9, 1, p. 1-10 10 p., 6778.

Effects of thymol on European honey bee hygienic behaviour

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Biogenic amine modulation of honey bee sociability and nestmate affiliation

Hewlett, S. E., Delahunt Smoleniec, J. D., Wareham, D. M., Pyne, T. M. & Barron, A. B., 25 Oct 2018, In: PLoS ONE. 13, 10, p. 1-18 18 p., e0205686.

The development of honey bee colonies assessed using a new semi-automated brood counting method: Combcount

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Abstract concept learning in a simple neural network inspired by the insect brain

Cope, A. J., Vasilaki, E., Minors, D., Sabo, C., Marshall, J. A. R. & Barron, A. B., 17 Sep 2018, In: PLoS Computational Biology. 14, 9, p. 1-21 21 p., e1006435.

Short-term exposure to lambda-cyhalothrin negatively affects the survival and memory-related characteristics of worker bees *Apis mellifera*

Liao, C. H., He, X. J., Wang, Z. L., Barron, A. B., Zhang, B., Zeng, Z. J. & Wu, X. B., Jul 2018, In: Archives of Environmental Contamination and Toxicology. 75, 1, p. 59-65 7 p.

Using within-day hive weight changes to measure environmental effects on honey bee colonies

Meikle, W. G., Holst, N., Colin, T., Weiss, M., Carroll, M. J., McFrederick, Q. S. & Barron, A. B., 23 May 2018, In: PLoS ONE. 13, 5, p. 1-21 21 p., e0197589.

Relationship between brain plasticity, learning and foraging performance in honey bees

Cabirol, A., Cope, A. J., Barron, A. B. & Devaud, J. M., 30 Apr 2018, In: PLoS ONE. 13, 4, p. 1-18 18 p., e0196749.

Cocaine directly impairs memory extinction and alters brain DNA methylation dynamics in honey bees

Søvik, E., Berthier, P., Klare, W. P., Helliwell, P., Buckle, E. L. S., Plath, J. A., Barron, A. B. & Maleszka, R., 13 Feb 2018, In: *Frontiers in Physiology*. 9, FEB, p. 1-11 11 p., 79.

Honey bee (*Apis mellifera*) sociability and nestmate affiliation are dependent on the social environment experienced post-eclosion

Hewlett, S. E., Wareham, D. M. & Barron, A. B., 13 Feb 2018, In: *Journal of Experimental Biology*. 221, 3, p. 1-8 8 p., 173054.

Stress decreases pollen foraging performance in honeybees

Bordier, C., Klein, S., Le Conte, Y., Barron, A. B. & Alaux, C., 1 Feb 2018, In: *Journal of Experimental Biology*. 221, 4, p. 1-5 5 p., jeb171470.

Cooperative defence operates by social modulation of biogenic amine levels in the honey bee brain

Nouvian, M., Mandal, S., Jamme, C., Claudianos, C., D'Ettoire, P., Reinhard, J., Barron, A. B. & Giurfa, M., 31 Jan 2018, In: *Proceedings of the Royal Society B: Biological Sciences*. 285, 1871, p. 1-9 9 p., 20172653.

The evolution of honey bee dance communication: A mechanistic perspective

Barron, A. B. & Plath, J. A., 1 Dec 2017, In: *Journal of Experimental Biology*. 220, 23, p. 4339-4346 8 p.

Experience during early adulthood shapes the learning capacities and the number of synaptic boutons in the mushroom bodies of honey bees (*Apis mellifera*)

Cabirol, A., Brooks, R., Groh, C., Barron, A. B. & Devaud, J. M., Oct 2017, In: *Learning and Memory*. 24, 10, p. 557-562 6 p.

The effects of fat body tyramine level on gustatory responsiveness of honeybees (*Apis mellifera*) differ between behavioral castes

Scheiner, R., Entler, B. V., Barron, A. B., Scholl, C. & Thamm, M., 8 Aug 2017, In: *Frontiers in Systems Neuroscience*. 11, p. 1-8 8 p., 55.

The frontiers of insect cognition

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Inter-individual variability in the foraging behaviour of traplining bumblebees

Klein, S., Pasquaretta, C., Barron, A. B., Devaud, J. M. & Lihoreau, M., 4 Jul 2017, In: *Scientific Reports*. 7, 1, p. 1-12 12 p., 4561.

***Drosophila* divalent metal ion transporter Malvolio is required in dopaminergic neurons for feeding decisions**

Søvik, E., Lamora, A., Seehra, G., Barron, A. B., Duncan, J. G. & Ben-Shahar, Y., Jun 2017, In: *Genes, Brain and Behavior*. 16, 5, p. 506-514 9 p.

Different roles for honey bee mushroom bodies and central complex in visual learning of colored lights in an aversive conditioning assay

Plath, J. A., Entler, B. V., Kirkerud, N. H., Schlegel, U., Galizia, C. G. & Barron, A. B., 30 May 2017, In: *Frontiers in Behavioral Neuroscience*. 11, p. 1-14 14 p., 98.

Learning, gustatory responsiveness and tyramine differences across nurse and forager honeybees

Scheiner, R., Reim, T., Søvik, E., Entler, B. V., Barron, A. B. & Thamm, M., 15 Apr 2017, In: *Journal of Experimental Biology*. 220, 8, p. 1443-1450 8 p.

Epigenetics and the evolution of instincts: instincts may evolve from learning and share the same cellular and molecular mechanisms

Robinson, G. E. & Barron, A. B., 7 Apr 2017, In: *Science*. 356, 6333, p. 26-27 2 p.

Why bees are so vulnerable to environmental stressors

Klein, S., Cabirol, A., Devaud, J.-M., Barron, A. B. & Lihoreau, M., Apr 2017, In: Trends in Ecology and Evolution. 32, 4, p. 268-278 11 p.

Making a queen: an epigenetic analysis of the robustness of the honeybee (*Apis mellifera*) queen developmental pathway

He, X. J., Zhou, L. B., Pan, Q. Z., Barron, A. B., Yan, W. Y. & Zeng, Z. J., Mar 2017, In: Molecular Ecology. 26, 6, p. 1598-1607 10 p.

A Computational model of the integration of landmarks and motion in the insect central complex

Cope, A. J., Sabo, C., Vasilaki, E., Barron, A. & Marshall, J. A. R., 27 Feb 2017, In: PLoS ONE. 12, 2, p. 1-19 19 p., e0172325.

Neuropharmacological manipulation of restrained and free-flying honey bees, *Apis mellifera*

Søvik, E., Plath, J. A., Devaud, J. M. & Barron, A. B., 26 Nov 2016, In: Journal of Visualized Experiments. 117, p. 1-11 11 p., e54695.

A horizon scan of future threats and opportunities for pollinators and pollination

Brown, M. J. F., Dicks, L. V., Paxton, R. J., Baldock, K. C. R., Barron, A. B., Chauzat, M. P., Freitas, B. M., Goulson, D., Jepsen, S., Kremen, C., Li, J., Neumann, P., Pattemore, D. E., Potts, S. G., Schweiger, O., Seymour, C. L. & Stout, J. C., 9 Aug 2016, In: PeerJ. 4, p. 1-20 20 p., e2249.

Reply to Adamo, Key et al., and Schilling and Cruse: crawling around the hard problem of consciousness

Klein, C. & Barron, A., 5 Jul 2016, In: Proceedings of the National Academy of Sciences of the United States of America. 113, 27, p. E3814-E3815 2 p.

What insects can tell us about the origins of consciousness

Barron, A. B. & Klein, C., 3 May 2016, In: Proceedings of the National Academy of Sciences of the United States of America. 113, 18, p. 4900-4908 9 p.

A systems approach to animal communication

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Physiology of reproductive worker honey bees (*Apis mellifera*): insights for the development of the worker caste

Peso, M., Even, N., Søvik, E., Naeger, N. L., Robinson, G. E. & Barron, A. B., 1 Feb 2016, In: Journal of Comparative Physiology A. 202, 2, p. 147-158 12 p.

Insect consciousness: commitments, conflicts and consequences

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Insects have the capacity for subjective experience

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Current progress in understanding the functions of the insect central complex

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Decision-making and action selection in insects: inspiration from vertebrate-based theories

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Embracing multiple definitions of learning

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Rapid behavioral maturation accelerates failure of stressed honey bee colonies

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Cocaine affects foraging behaviour and biogenic amine modulated behavioural reflexes in honey bees

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Differences in the phototaxis of pollen and nectar foraging honey bees are related to their octopamine brain titers
Scheiner, R., Toteva, A., Reim, T., Søvik, E. & Barron, A. B., 2014, In: *Frontiers in Physiology*. 5, p. 1-8 8 p., 116.

Genital evolution: why are females still understudied?

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Honey bees selectively avoid difficult choices

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Dynamic modelling of honey bee (*Apis mellifera*) colony growth and failure

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A comparison of digital gene expression profiling and methyl DNA immunoprecipitation as methods for gene discovery in honeybee (*Apis mellifera*) behavioural genomic analyses

Guan, C., Barron, A. B., He, X. J., Wang, Z. L., Yan, W. Y. & Zeng, Z. J., 9 Sep 2013, In: *PLoS ONE*. 8, 9, p. 1-10 10 p., e73628.

Invertebrate learning and cognition: Relating phenomena to neural substrate

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Assessment of flight activity and homing ability in Asian and European honey bee species, *Apis cerana* and *Apis mellifera*, measured with radio frequency tags

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Awards

Projects

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1/11/19 → 31/10/22

Analysing the neural mechanisms of animal cognition and behaviour

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1/01/16 → 31/12/16

An analysis of the distribution of degrees of intelligence across animal groups

Barron, A.

4/06/18 → 3/06/20

A new understanding of complex systems through study of self-assembled swarm architecture in ants

Reid, C. & Barron, A.

30/06/17 → ...

Automated Fluorescence Stereo Microscope

Narendra, A., Taylor, P., Lindsay, S., Barron, A., Herberstein, M., Hart, N., Williamson, J., Griffith, S., Whiting, M., Brock, G. & Jacob, D.

1/01/17 → 31/12/17

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Combined gas chromatography/ electroantennogram detector for insect olfaction research

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1/01/15 → 31/12/15

Comprehending and modelling the workings of the animal brain

Barron, A., MQRES (International), M. (. & MQRES, M.
1/06/15 → 31/12/20

MQRIS Small: Enhancing electrochemical recording techniques in the animal research facility

Cornish, J., Baracz, S., McMullan, S., Goodchild, A., Barron, A. & Hildreth, C.
1/01/18 → 31/12/18

Exploring neurogenomic adaptations to repeated cocaine exposure in honey bees

Barron, A.
22/10/08 → 21/10/09

Gene expression analysis system

Barron, A., Cheng, K., Taylor, P., Nelson, X. & Pryke, S.
1/01/08 → 31/12/08

High quality ultramicrotome for precision specimen preparation for optical and electron microscopy

Deng, W., Chung, R., Nevalainen, H., Phillips, J. K., McMorran, B. & Barron, A.
1/01/14 → 31/12/14

High Throughput Molecular Sample Processing Facility

Zakoshanski, I., Paulsen, I., Whiting, M., Power, M., Lanfear, R., Barron, A., Westoby, M., Warren, D., Van Sluyter, S., Clarke, T., Wunderlin, T., Ostrowski, M., Mazard, S. & Tetu, S.
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Barron, A. & Meikle, W.
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Invertebrate olfaction facilities

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Knowing what you don't know: analyzing the biology of metacognition and uncertainty in a simple model system

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Molecular memory: how DNA methylation contributes to spatial memory

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Operant behavioural chambers for rat research

Cornish, J., Clemens, K., Staples, L., Goodchild, A., Haynes, P., Barron, A., Baillie, A. & Pilowsky, P.

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12/02/18 → 31/12/18

Protecting Australia's honey bee pollinators

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1/11/21 → 31/10/23

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25/07/17 → ...

Real-time qPCR system for gene detection, gene expression analysis and single nucleotide polymorphisms genotyping in Biology research

Hart, N., Ponton, F., Narendra, A., Barron, A., Shine, R. & Clulow, S.

1/01/20 → 29/05/20

The bionic bee brain

Barron, A.

19/06/15 → 24/08/15

The genomic response to colony disease stress in honey bees

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MTEC: The major transitions in the evolution of cognition

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1/11/20 → 31/10/23

The molecular and cellular basis the memory in the honey bee

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1/08/09 → 30/07/11

Towards a Bionic Brain

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30/04/14 → 25/12/14

Understanding colony collapse: a social analysis of honey bee colony failure

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1/07/11 → 31/12/14

Understanding the functions of neural circuit changes in visual navigation

Kamhi, F., Narendra, A. & Barron, A.

1/01/17 → 31/12/18

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1/01/09 → 31/12/12