

Light fantastic: why birds burst into song at dawn as spring arrives

By Steve Connor, Science Editor

¹ Songbirds produce a chemical messenger that responds to increasing light levels in spring.

² Throughout history, their singing has fascinated authors, poets and songwriters – particularly as birdsong is so closely associated with the end of winter. Now scientists believe they have found a vital clue to explain the rise of the spring dawn chorus.

³ The reason why birds burst into song in spring is down to a key chemical messenger produced by a part of the brain that responds to the increased light levels resulting from the lengthening days, the researchers have discovered.

⁴ A study has found that cells on the surface of a part of the brain called the hypothalamus produce a hormone which triggers the distinctively joyous birdsong marking the onset of spring. Scientists believe that the same hormone is produced by a similar set of cells in the human brain, although they are not sure what effect this has – if any – on people's springtime behaviour.

'hormone ... triggers the distinctively joyous birdsong'

⁵ 'While we knew what area of the bird's brain was affected by seasonal change, until now we did not know the exact mechanism involved,' said Professor Peter Sharp, of the Roslin Institute, near Edinburgh, who first identified the brain area involved with singing some 40 years ago. 'Now we have identified a key element in the process of the brain's activity when spring arrives. Such knowledge would have been impossible in the past, but advances in technology enabled us to scan thousands of genes so that we could work out which ones are affected by seasonal change,' said Professor Sharp.

⁶ The research, led by Professor Takashi Yoshimura, of Nagoya University in Japan, analysed the

activity levels of about 28,000 genes – almost the entire bird genome – in the surface cells of a part of the hypothalamus known to be involved in birdsong.

⁷ The scientists found that a well-known chemical messenger, called thyroid-stimulating hormone, is produced by these cells in response to lengthening daylight hours. The hormone stimulates the release of sex hormones that prepare the birds physically for the coming spring season by putting them into breeding condition, said Professor Sharp.

⁸ 'Thyroid-stimulating hormone is normally produced in the pituitary gland at the base of the brain, and although it was known for some years that it was also produced in this region of the hypothalamus, no one had any idea why,' he said.

⁹ 'Interestingly, the human brain has exactly the same surface cells in the hypothalamus and they too produce a thyroid-stimulating hormone, but why it is there and what it is for, nobody knows,' he added.

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¹⁰ The study, which is published in the journal *Nature*, was carried out on Japanese quails. The findings revealed that the genes involved in triggering birdsong in spring are activated in two waves. The first wave of gene activation occurs roughly 14 hours after dawn on the first day of sufficient day length, and the second occurs roughly four hours later.

¹¹ Birds sing in order to attract mates, mark territories and fend off

rivals – which become increasingly important when the breeding season arrives.

‘it may help in treating infertility’

¹² Courtship and territory defending are at their most intense in spring and early summer, which accounts for the increase in birdsong at the end of the winter months.

¹³ Professor Sharp said that there may be wider implications in the study of the chemical process that takes place in the brain of a bird when spring arrives. ‘The knowledge of a new process that indicates to birds it is the mating season could have implications in our greater understanding of reproduction,’ he said.

¹⁴ ‘A long way down the line it may even help in treating infertility, for instance by identifying causal gene mutations.’ ■