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Senior Lecturer

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About

My interests are focused on genome evolution and meiosis in both model plants and crops. In 1995 I setup a molecular cytogenetics laboratory with my colleague Paul Fransz (now at University of Amsterdam) and with advice from our colleague Gareth Jones. In the last 15 years we have trained many European colleagues and last year we were awarded a European collaborative project to investigate the meiotic pathway in the model plant Arabidopsis and crop species.

Qualifications

BSc, PhD

Biography

Initially I taught at a local technical college and combined this with working for a PhD on chromosome staining techniques and interspecific hybridisation in the genus Allium by part-time research. Subsequently I researched on mammalian meiosis, before returning to University of Birmingham in 1995.

Teaching

Undergraduate teaching

BIO 265 Genes and genomes from micro-organisms to man: Mutation and DNA repair, human genetics (Module organiser)

BIO 348 Genetic variation in Humans: Chromosome rearrangements; telomeres, evolution of sex chromosomes(Module organiser)

Post graduate teaching

MSc Analytical Genomics: Module leader; Mapping genes and genetic markers

Postgraduate supervision

For a list of possible **PhD projects (http://www.findaphd.com/search/customlink.asp?inst=birm-Biol&supersurname=Armstrong)** offered by Dr Armstrong

Research

Research Theme within School of Biosciences: **Molecular and Cell Biology (/research/activity/cellbiology/index.aspx)**

Organisation and behaviour of chromosomes in plant meiosis

My research interests are concerned with meiosis, a highly conserved pathway, by which haploid gametes are formed following a double cell-division process. Our laboratory is interested in chromosome behaviour during pairing, recombination and synapsis in plant meiosis. We use molecular cytogenetic and immunolocalisation techniques combined with the molecular resources available for Arabidopsis molecular biology, to investigate aspects of this complex process that continues to be poorly understood.

We (Professor Franklin and I) have recently been awarded a LOLA award to transfer our Arabidopsis knowledge to investigate meiosis in barley and to find ways to manipulate crossover frequency and distribution in this cereal (see **Professor Chris Franklin web-page for details (/staff/profiles/biosciences/franklin-chris.aspx)**). I am also co-ordinator for an **EU collaborative project (http://www.meiosys.eu)**

Currently my research falls into 3 areas:

1. Telomere biology in Arabidopsis We are investigating how homologous telomeres pair during early meiotic prophase. Recent attention has been paid to the bouquet, a nearly universal event during which telomeres move and cluster in early prophase. We are looking at pairing in telomere deficient plants in order to understand the significance of this early step in the meiotic pathway.

2. Genetic and cytogenetic investigation of homoeologous pairing and recombination in B. Napus (AACC). Breeders wishing to introduce new characteristics into the *B. Napus* (oil seed rape) crop are creating synthetic lines by crossing *B. Oleracea* with *B. Rapa*. In natural B. Napus plants pairing control is strict; (A/A and C/C) whereas in synthetics pairing control is less strict (A/C) and can lead to unstable progeny and loss of fertility. We are investigating the nature of this problem.

3. Evolution of sex chromosomes in the plant genus Silene. I collaborate with DA Filatov (Oxford). Our joint research interests are concerned with evolution and chromosome behaviour in meiosis in the genus *Silene*. This plant genus provides an opportunity to conduct a comparative cytogenetical study of the relatively early stages of sex chromosome evolution because it contains cytologically distinguishable heteromorphic sex chromosomes that have evolved relatively recently, 10-20 million years ago. We are using the cytogenetics tools we have developed for *Arabidopsis* to analyse the changes in sex chromosome structure and meiotic behaviour during sex chromosome evolution in *Silene*.

We are carrying out a high resolution comparative cytogenetic analysis of the X and Y chromosomes in dioecious *Silene*. In particular, we are investigating (i) How the structure of chromosomes have evolved to form clearly distinguishable heteromorphic X and Y chromosomes. (ii) How these plants cope with heterologous sex chromosomes during meiosis; specifically do they restrict pairing to the pseudoautosomal region (PAR) of the X and Y in plants? (iii) and what mechanisms are involved in suppressing recombination in the non-recombining regions (NRY) of the *Silene* Y chromosome? Overall, we would like to know if these mechanisms are similar to those arrived at in mammalian systems or alternatively, are we looking at novel approaches to achieve the same outcome.

Other activities

I am currently the second year academic tutor.

Publications

Publications 2000 onwards...

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SJ Armstrong, FCH Franklin, GH Jones. 2001. Nucleolus-associated telomere clustering precede meiotic chromosome synapsis in Arabidopsis thaliana. Journal of Cell Science 114, 4207-4217.

EC Howell, GC Barker, GH Jones, MJ Kearsey, GJ King, EP Kop, CD Ryder, GR Teakle, JG Vicente, SJ Armstrong. 2002. Integration of the cytogenetic and genetic linkage maps of Brassica oleracea. Genetics 161, 1225-1234.

SJ Armstrong, GH Jones. 2003. Meiotic cytology and chromosome behaviour in wild-type Arabidopsis thaliana. Journal of Experimental Botany 54, 1-10.

R Mercier, S J Armstrong, C Horlow, N P Jackson, CA Makaroff, D Vezon, G Pelletier, G H Jones, FCH Franklin. 2003. The meiotic protein SWI1 is required for axial element formation and recombination initiation in Arabidopsis thaliana. Development 130, 3309-3318.

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C. Kerzendorfer ,J Vignard , A Pedrosa-Harand A, T Siwiec, S Akimcheva, S Jolivet, R Sablowski, SJ Armstrong, D Schweizer, R Mercier, P SchlÃ¶egelhofer. 2006. The Arabidopsis thaliana Meiotic Nuclear Division I (MNDI) homologue plays a key role in meiotic homologous recombination and synapsis. Journal of Cell Science, 119, 2486-2496.

J Vignard, T Siwiec, Lchelysheva, N Vrielynch, F Gonord, SJ Armstrong, P SchlÃ¶gelhofer, R Mercier 2007. The interplay of RecA-related proteins and the MND1-HOP2 complex during meiosis in Arabidopsis thaliana. . Plos Genet 3(10)

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DA Filatov, EC Howell, C Groutides, SJ Armstrong. 2009. Recent spread of a retrotransposon in the *Silene latifolia* genome apart from the Y chromosome. *Genetics*181, 811-817

NR Roberts, K Osman, SJ Armstrong. 2009. Telomere Distribution and Dynamics in Somatic and Meiotic Nuclei of *Arabidopsis thaliana. Cytogenet. Genome Res.* 124, 193-201

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