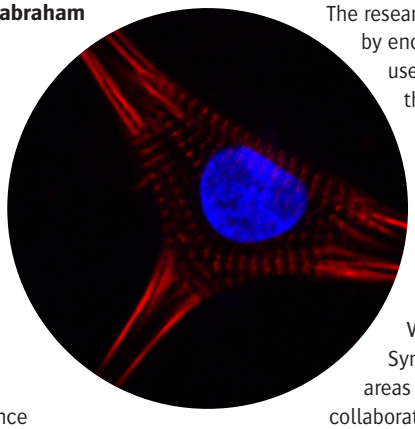
Science Strategy

This year we celebrate the 60th birthday of the Babraham Institute. These 60 years have seen remarkable changes in the areas of science that have been tackled at the Institute, and what strategies we take in order to solve these challenges successfully. We are now addressing key biomedical questions of relevance to the BBSRC's remit, such as work on stem cells, epigenetics and chromatin, development, signalling, infection, the immune system, and increasingly computational and systems biology.



The continuing and growing success of BI science has a number of roots. First, there is a very strong science tradition and critical mass particularly in Signalling, Immunity and Epigenetics & Chromatin, and this creates an attractive environment for new recruits, Fellowship holders (most of whom are considered for tenure track appointments at the Institute), postdocs and students alike. This is helped by strong connections with the University of Cambridge; we are a graduate teaching department for the University and also have many other collaborative and science strategy links including, for example, strong collaborative links with the Department of Physiology, Development, and Neuroscience through the newly established Centre for Trophoblast Research.

We also have long-standing collaborations with the MRC Laboratory of Molecular Biology, including the construction and running of new state-of-the-art small animal facilities. Such facilities are pivotal for modern *in vivo* biomedical research and we are making major investments into the best possible conditions for housing mice and rats humanely and into the most advanced research capabilities. *In vivo* biology in genetic animal models remains of the utmost importance for post-genomic biology, and we and other major Institutes in the South Cambridge science corridor are deeply committed to this approach.

The research environment we are creating is characterised by encouragement to interact, collaborate, make best use of excellent facilities which we provide, and share the intellectual excitement of scientific endeavour. Individual group leaders are loosely organised into Laboratories which share scientific interests, resources and usually space, but the Institute as a whole does not have divisions and all key decisions are made by the Executive Committee on which senior group leaders from the key science areas are represented.

We particularly encourage collaboration in the form of Synergy Programmes, where group leaders from different areas can apply for internal funding to carry out innovative collaborative work. We are keen to see new links emerge between Signalling and Chromatin, and Immunity and Chromatin, in particular, and a number of promising projects have started that tackle these links (see inset, page 9). The increasing use of computational biology, bioinformatics, cutting edge imaging technologies and high throughput genomics and epigenomics technologies, including from this year Next Generation Sequencing, adds exciting dimensions to our work and makes our environment stimulating and challenging.

One of the key features of a Research Institute is that it brings important and relevant areas of science together in a longer-term funded environment. The core funding we receive from the BBSRC enables us to make medium and longer-term strategic decisions and to invest into science whose promise might only just be visible. At the time of writing, the way we bid for and justify this core grant is changing in a science-driven way. We are moving towards three Institute Strategic Programme Grants (ISPG), which are glued together by an Institute Integration Award (IIA). The ISPGs have been an interesting exercise in defining our science vision across the Institute more sharply; as a result the Signalling, Immunology and Epigenetics & Chromatin ISPGs were created, reflecting current science strengths and areas of future investment (see ISPG inset).

Babraham's Institute Strategic Programme Grants (ISPG)

The Signalling ISPG aims to provide molecular explanations for cellular processes. We approach this in two ways; either by characterising new concepts in intracellular signalling that are so broadly important in biology they are relevant in practically all cells, or alternatively, by providing precise molecular explanations for specific cellular responses. In line with these approaches we focus on a number of key biomedical questions particularly in neutrophils (in order to understand the cellular response to infection), muscle, neurons, autophagy (whereby cells digest themselves to survive periods of starvation), cancer, and ageing. The development of new technology platforms, for example imaging bio-sensors in complex 3D tissues *in vivo*, is also part of the plan of this ISPG. Links exist or are being developed with the other two ISPGs, particularly in understanding signalling systems in the immune system and in linking up intracellular signalling pathways with specific chromatin responses.

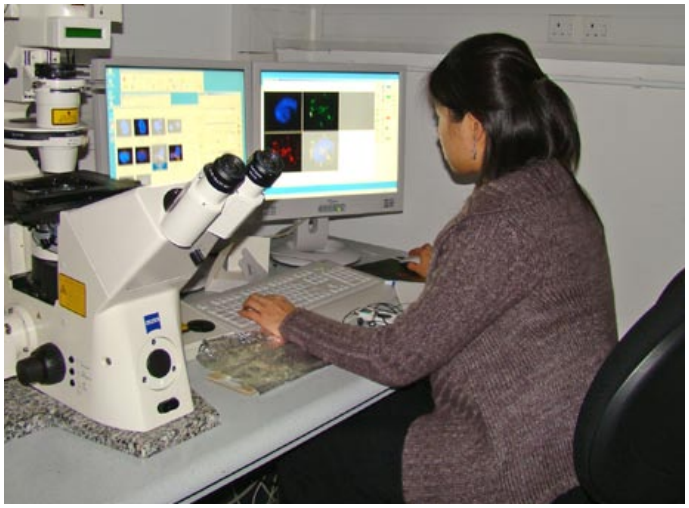
The Immunology ISPG aims to identify genes and molecular pathways that control the development, growth, survival and ageing and function of cells in the immune system. This will result in a much better understanding of how T and B lymphocytes as well as Natural Killer (NK) cells do their jobs in fighting infection, how their deregulation can result in cancer and in autoimmunity and how they are involved in other physiological processes, for example pregnancy.

The Epigenetics & Chromatin ISPG deals with the mechanistic make-up of the Epigenome, particularly epigenetic marks and their dynamics, nucleosome remodellers, non-coding and microRNAs, and nuclear dynamics including the comprehensive mapping of the nuclear 'Interactome'. The external influences that shape the Epigenome are also of great interest, and include genetics, developmental events, signalling, and the environment. How the dynamics of the Epigenome affect developmental and physiological processes, for example stem cells, or fat and glucose metabolism, is also addressed. Links are being developed with the other ISPGs, for example to understand how epigenetic regulation, by non-coding RNAs, affects the development and function of the immune system.

These Programme grants will allow future expansion of highly successful science areas, thus injecting more flexibility and competitive growth potential into our core funding.

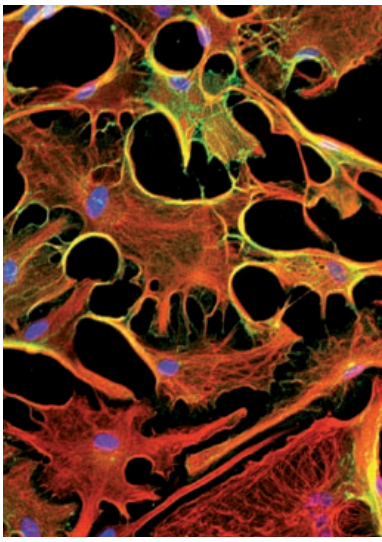
The Institute's science programme is not only well positioned to deliver some of the important missions within the BBSRC's portfolio, but also spans pivotal areas of MRC interest, with other areas being relevant to CRUK and the Wellcome Trust, for example. As a result, our scientists attract considerable grant funding not only from the BBSRC, but also from MRC, and the other main funding bodies as well as many charities.

Our firm belief is that basic biology in the biomedical area is hugely important for the future of biomedicine. In this respect, our work is directly relevant to pressing needs of UK society, health and wellbeing, which are being recognised by the BBSRC. For example, we have just launched a new science programme in which we address the biology of ageing from unique perspectives of strengths at the Institute, namely Signalling, Immunology and Epigenetics. We are grateful to the the BBSRC for encouraging



the strength of this approach by putting additional resources into the Babraham Institute for this programme of work, and are looking forward to making exciting staff appointments in the near future.

We continue to encourage the translation of our research into medicine and biotechnology and many of us collaborate locally, nationally, or internationally with the biotech or biomedical industry. In no small measure such interactions are encouraged and supported by our local application and translation arm, Babraham Bioscience Technologies (BBT) Ltd., with whom we have reciprocal collaborations at many different levels.



We hope that you enjoy reading about the many different and exciting science approaches and scientific highlights that are reported in these pages by our colleagues!

Current Synergy Projects

Stephen Gaunt and Simon Cook:
Signalling pathway regulation of human and mouse cdx genes

Francesco Colucci and Myriam Hemberger:
Paternal Antigens, Maternal Killer Lymphocytes and Reproduction

Michael Coleman and Simon Cook:
Signalling events that regulate Wallerian degeneration

Elena Vigorito, Martin Turner and Klaus Okkenhaug:
Regulation of T cells by microRNAs

Heidi Welch and Tom Bellamy:
Role of the P-Rex family in neuronal plasticity