GOBIERNO DE CHILE
FUNDACIÓN PARA LA
INNOVACIÓN AGRARIA

PROGRAMA DE FORMACIÓN PARA LA INNOVACIÓN AGRARIA

BECAS PARA FORMACIÓN

VENTANILLA ABIERTA

⇨ **FORMULARIO DE POSTULACIÓN**

ENERO 2005

GOBIERNO DE CHILE
FUNDACIÓN PARA LA INNOVACIÓN AGRARIA

Página Número

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DICIEMBRE DE 2005

Programa de Formación para la Innovación
Becas para Formación
Ventanilla Abierta 2005
Formulario de postulación

GOBIERNO DE CHILE
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PROGRAMA DE FORMACIÓN
BECAS PARA FORMACIÓN
FORMULARIO DE POSTULACIÓN

FOLIO DE BASES 98

CÓDIGO (uso interno) FIA-FP-V-2005-1-A097

SECCIÓN 1. ANTECEDENTES GENERALES DE LA PROPUESTA

NOMBRE DE LA ACTIVIDAD

"Comparacion de la expresion de genes durante la senescencia de hojas y petalos de *Erysimum linifolium*"

TIPO O MODALIDAD DE FORMACIÓN

[ ] Curso corto [ ] Curso de especialización [X] Pasantía [ ] Otro, ¿cuál?

AREAS O SECTORES

[X] Agrícola [ ] Pecuario [ ] Forestal [ ] Dulceacuícola

RUBRO (S)

Floricultura

TEMAS (S)

Biotecnología – Postcosecha - Información

INSTITUCIÓN O ENTIDAD RESPONSABLE QUE DICTA U ORGANIZA LA ACTIVIDAD DE FORMACIÓN

(Adjuntar información complementaria en el Anexo 3)

Nombre: Cardiff University – School of Biosciences
Dirección Comercial completa: Museum Avenue CF 10 3US – Cardiff – Wales – UK
Página web: http://www.cardiff.ac.uk/index.html
Correo electrónico: international@cf.ac.uk

LUGAR DE REALIZACIÓN DE LA ACTIVIDAD

Cardiff University
School of Biosciences
Cardiff
Gales
Reino Unido

ENTIDAD PATROCINANTE (en caso que corresponda)

Nombre completo: UNIVERSIDAD DE CHILE – Facultad de Ciencias Agronómicas
Dirección completa: Santa Rosa 11315 – La Pintana - Santiago
Fono: 678 57 17
Fax: 678 57 26
Correo electrónico: Info@uchile.cl
Página Web: http://agronomia.uchile.cl
Cuenta Bancaria *(tipo, Número, Banco)*:

TIPO DE ENTIDAD PATROCINANTE

UNIVERSIDAD

NATURALEZA ENTIDAD PATROCINANTE

[X] Pública [ ] Privada

REPRESENTANTE LEGAL DE LA ENTIDAD PATROCINANTE

Nombre: Mario Silva Genneville
RUT:
Cargo en la Entidad Patrocinante: Decano de la Facultad de Ciencias Agronómicas
Dirección completa: Santa Rosa 11315 – La Pintana - Santiago
Fono: 9785753
Fax: 5417055
Correo electrónico: msilva@uchile.cl

UNIVERSIDAD DE CHILE * DECANO * FACULTAD DE CIENCIAS AGRONÓMICAS

Firma

COORDINADOR DE LA EJECUCIÓN

(Sólo para propuestas grupales, adjuntar curriculum vitae completo en **Anexo 1** y pauta resumida en **Anexo 2**)

Nombre completo:
RUT:
Lugar o institución donde trabaja:

Cargo o actividad principal:

Tipo de Relación contractual con la empresa u organismo donde trabaja:

Firma

FECHA DE INICIO Y TÉRMINO DEL PROGRAMA DE ACTIVIDADES

Inicio: 27 de enero de 2006 **Término:** 21 de junio de 2006

ESTRUCTURA DE FINANCIAMIENTO

COSTO TOTAL DE LA PROPUESTA	**$**		
FINANCIAMIENTO SOLICITADO	**$**		**%**
APORTE DE CONTRAPARTE	**$**		**%**

SECCIÓN 2. IDENTIFICACIÓN DE LOS POSTULANTES

IDENTIFICACIÓN POSTULANTE INDIVIDUAL

(Completar sólo para propuestas individuales y adjuntar curriculum vitae en Anexo 1 y ficha resumida de antecedentes personales en Anexo 2)

Nombre completo: DANILO FERNANDO AROS ORELLANA

RUT :

Lugar o Institución donde trabaja: UNIVERSIDAD DE CHILE - Facultad de Cs. Agronómicas

Cargo o actividad principal: Profesor ayudante

Tipo de Relación contractual con la empresa u organismo donde trabaja : Contrato indefinido

Firma Participante: Danilo

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CUADRO RESUMEN DE LOS PARTICIPANTES EN LA ACTIVIDAD DE FORMACIÓN

N°	Nombre del participante	RUT	Lugar o entidad en donde trabaja	Actividad que realiza (productor, investigador, docente, empresario,	Región
1	DANILO FERNANDO AROS ORELLANA		Fac. de Cs. Agronómicas - U. de Chile	Investigador	RM
2					
3					
4					
5					

SECCIÓN 3. JUSTIFICACIÓN DE PARTICIPACIÓN EN LA PROPUESTA

El equipo de floricultura de la Facultad de Cs. Agronómicas de la Universidad de Chile, en función de la información generada a partir de los seminarios en floricultura organizados por nuestra institución y cofinanciados por FIA en los últimos tres años (2003, 2004 y 2005), ha impulsado el desarrollo de nuevas líneas de investigación. Dentro de estas nuevas líneas, el estudio de los mecanismos que permitan prolongar la vida de poscosecha de flores, es hoy en día, un pilar fundamental para el desarrollo de este rubro.

Considerando que la vida en poscosecha es un gran factor diferenciador, más aún comprendiendo el desafío que implica para la industria nacional la exportación de flores frescas hacia mercados lejanos, este tema es de suma relevancia para el sector floricultor nacional y debe ser abordado desde distintas áreas (fisiología, genética, manejo, etc.) y por los distintos agentes que están involucrados en su producción y comercialización.

Para esto, es necesario generar una sólida base que permita desarrollar soluciones definitivas a través del uso de la biotecnología, partiendo por entender los mecanismos genéticos que controlan la senescencia de flores y hojas en los cultivos ornamentales. Esta información permitirá definir de mejor forma las diferentes líneas de acción para abordar el problema, por ejemplo a través de programas de mejoramiento genético con selección asistida, apoyadas por herramientas biotecnológicas.

En este sentido, el Grupo *Molecular Cell Biology Research Group (Biosciences School, Cardiff University)* dirigido por la Dr. Hilary Rogers, es uno de los equipos más importantes en el mundo en el estudio de los mecanismos que controlan la senescencia en pétalos y hojas de especies ornamentales, lo que es posible verificar a través del alto número de publicaciones en revistas de alto impacto científico, currículo de sus investigadores y número de tesis de pregrado y doctorado. También, cuentan con laboratorios y equipamiento de primer nivel, relaciones con otros centros de investigación y una vasta experiencia en el entrenamiento y capacitación de personal altamente calificado. Una de las líneas de investigación desarrolladas, ha apuntado hacia la identificación de algunos genes que participan en la senescencia de pétalos y hojas y que previamente hayan sido identificados en la planta modelo *Arabidopsis thaliana*.

Según lo expuesto, la posibilidad de realizar una pasantía de investigación en esta universidad, permitirá la capacitación de un miembro del grupo de floricultura en el uso de herramientas biotecnológicas como una forma para conocer y determinar los procesos básicos que finalmente controlan el comportamiento en poscosecha de plantas ornamentales. Todo esto, facilitará la adecuada orientación de esta línea de trabajo, que finalmente se canalizarán en una iniciativa que busquen consolidación del trabajo en este tema, con una base metodológica adecuada junto a la cooperación de investigadores internacionales de primer nivel.

Dentro del Grupo de Floricultura, dirigido por Carol Müller (Ing. Agr. MS), han determinado que Danilo Aros (Ing. Agr.) es la persona más idónea para realizar esta actividad, ya que además de su experiencia en el uso de biotecnología aplicada en floricultura y su manejo del inglés, en septiembre de este año realizó un pasantía de investigación en *Cardiff University, School of Biosciences*, en donde se capacitó en metodologías de genómica básica. Esta experiencia permitiría su rápida adaptación al sistema de trabajo y al cumplimento del plan de trabajo propuesto en este proyecto. Además es formulador de la presente propuesta.

Finalmente, la pasantía de investigación para la cual se solicita financiamiento de FIA, permitirá comenzar esta línea de trabajo en la Facultad de Ciencias Agronómicas de la Universidad de Chile, utilizando un enfoque biotecnológico en la Floricultura, reproduciendo y consolidando este tipo de trabajo, como base para el desarrollo de proyectos que entregarán soluciones concretas a los nuevos desafíos de la industria florícola nacional.

SECCIÓN 4. OBJETIVOS DE LA PROPUESTA

4.1. OBJETIVO GENERAL

Introducir el uso de herramientas biotecnológicas para conocer los mecanismos básicos y los genes involucrados en el comportamiento durante poscosecha en plantas ornamentales.

4.2 OBJETIVOS ESPECÍFICOS

- Adquirir una base metodológica en genómica funcional en plantas ornamentales.

- Desarrollar acuerdos de cooperación con el grupo *Molecular Cell Biology* de *Cardiff University* y con otros centros de Investigación.

- Difundir la experiencia obtenida en el medio, para su implementación y desarrollo en el país.

SECCIÓN 5. ANTECEDENTES DE LA INSTITUCION QUE DICTA LA ACTIVIDAD DE FORMACIÓN

Es importante destacar que *Cardiff University* es el principal centro de estudios de Postgrado en el Reino Unido, la Comunidad Europea y el Resto del Mundo, con más de 4.000 estudiantes.

Respecto al prestigio de esta institución y en particular de la School of Biosciences, es importante destacar que esta Escuela presenta cada año un promedio de 300 publicaciones cientificas, de las cuales alrededor de 200 corresponden a biología genética y molecular.

En el área específica de mi interés, en el 2003 fueron publicados 3 artículos en los temas de Biología Celular y Senescencia Floral y en el 2004 otros 3 artículos en el tema de Floración. Además existen otros dos en vías de publicación.

SECCIÓN 6. DESCRIPCIÓN DE LA ACTIVIDAD DE FORMACIÓN

Objetivos

General:
Identificar genes relacionados con la senescencia de hojas y pétalos de *Erysimum linifolium.*

Específicos:

Extraer RNA y luego obtener cDNA desde distintos estados de desarrollo de hojas y pétalos de *Erysimum linifolium.*

Optimizar condiciones de PCR en función de partidores que amplifiquen para genes específicos descritos previamente en *Arabidopsis thaliana.*

Identificar la presencia en el genoma *Wallflower* de algunos genes descritos previamente en *Arabidopsis.*

Conocer en detalle los patrones de expresión de tres genes seleccionados, durante la senescencia de *Wallflower.*

Contenidos

Biología Molecular

Genómica

Fisiología

Postcosecha

Floricultura

Equipo docente o instructor(es)

Dr Hilary Rogers PhD
RogersHJ@cardiff.ac.uk
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Dr Anthony D Stead
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United Kingdom
Tel: 01784-443761
Fax: 01784-470756

Programa de Actividades

- Extracción de ARN desde cinco estados de desarrollo de hojas y ocho estados de desarrollo de pétalos de Wallflower (*Erysimum linifolium).*

- Obtención del cDNA de cada estado a través de RT-PCR.
- Optimización de protocolos de PCR en función del numero de ciclos de la reacción, cantidad de cDNA, y temperatura de *annealing.*

- Amplificación de algunas secuencias con partidores específicos que permiten la expresión de algunos genes previamente identificados en *Arabidopsis thaliana.*

- Desarrollo de *Semi-quantitative RT-PCR* empleando los diferentes estados de desarrollo de pétalos y hojas para luego ver en detalle los patrones de expresión de tres genes seleccionados.

- Secuenciación de alrededor de veinte genes que presenten patrones de expresión interesantes en los datos entregados por el *microarray.* Los datos serán luego analizados por herramientas bioinformáticas.

- Los datos analizados serán comparados con los obtenidos previamente en *Arabidopsis thaliana.* Esta información está disponible en bases de datos públicas y entre otras cosas, permitirá establecer diferencias especie-específicas entre *Arabidopsis* y *Wallflower.*

- Charla de difusión para difundir la información y la experiencia adquirida durante la pasantía de investigación.

- Colaboración al grupo *Molecular Cell Biology* (*Cardiff University*) en la elaboración de artículo científico que será publicado en alguna revista de alto impacto científico.

- Preparación y desarrollo de la Clase :"Biotecnología en la Floricultura", que será presentada en la cátedra de Floricultura de la Facultad de Cs. Agronómicas de la U. de Chile.

- Establecimiento y consolidación redes de contacto entre la Universidad de Chile y centros de investigación reconocidos a nivel mundial.

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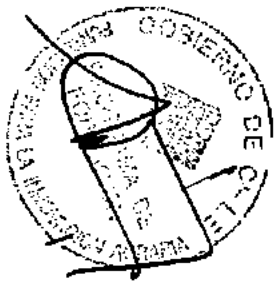
SECCIÓN 7. ACTIVIDADES DE DIFUSIÓN

FECHA (Día-mes-año)	TIPO DE ACTIVIDAD	OBJETIVO	LUGAR	Nº Y TIPO BENEFICIARIOS	INFORMACIÓN A ENTREGAR
26/04/2006	Charla de Difusion	Difundir la información y la experiencia adquirida durante la pasantía de investigación.	Fac. de Cs. Agronomicas - U. de Chile	80 personas - Academicos - Investigadores - Alumnos	Experiencia en metodologías biotecnológicas y su aplicación en la solución de problemas específicos, como la poscosecha
04/08/2006	Clase en Cátedra de Floricultura	Entregar un enfoque biotecnológico básico aplicado a la Floricultura a alumnos de la cátedra de Floricultura de la Fac. de Cs. Agronómicas de la U. de Chile.	Fac. de Cs. Agronomicas - U. de Chile	20 Alumnos de la Cátedra de Floricultura	Conocimientos básicos de Biotecnología aplicada en la Floricultura, su importancia y utilidad.



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SECCIÓN 8. CRONOGRAMA DE ACTIVIDADES DE LA PROPUESTA

FECHA (Día-mes-año)	ACTIVIDAD	OBJETIVO	LUGAR
30-01-06 / 07-02-06	Extracción de ARN desde hojas y pétalos de Wallflower (Erysimum linifolium).	Obtener el ARN de distintos estados de desarrollo para luego obtener cDNA a través de RT-PCR.	Cardiff University, School of Biosciences
07-02-06 / 14-02-06	Obtención del cDNA.	Obtener el cDNA de distintos estados de desarrollo de pétalos y hojas, para identificar la presecia de genes específicos.	Cardiff University, School of Biosciences
14-02-06 / 21-02-06	Optimización de protocolos de PCR.	Desarrollar un protocolo de PCR que permita realizar una óptima amplificación.	Cardiff University, School of Biosciences
21-02-06 / 02-03-06	Amplificación de algunas secuencias con partidores específicos.	Identificar la presencia en el genoma *Wallflower* de algunos genes descritos previamente en *Arabidopsis*.	Cardiff University, School of Biosciences
02-03-06 / 13-03-06	Desarrollo de Semi-quantitative RT-PCR.	Conocer en detalle los patrones de expresión de 3 genes seleccionados, durante la senescencia de*Wallflower*.	Cardiff University, School of Biosciences
13-03-06 / 23-03-06	Secuenciación de 20 genes que presenten patrones de expresión interesantes.	Conocer la función de genes específicos, durante la senescencia de*Wallflower*.	Cardiff University, School of Biosciences
23-03-06 / 31-03-06	Comperación de los datos analizados con los obtenidos previamente en *Arabidopsis*.	Establecer diferencias especie-específicas entre *Arabidopsis* y*Wallflower*.	Cardiff University, School of Biosciences
31-03-06 / 28-04-06	Preparación de informe y análisis de datos.	Reunir y analizar toda la información obtenida durante la pasantía de investigación.	Universidad de Chile, Facultad de Cs. Agronómicas
25/04/2006	Charla de difusión.	Difundir la información y la experiencia adquirida durante la pasantía de investigación.	Universidad de Chile, Facultad de Cs. Agronómicas
28-04-06 / (...)	Establecimiento y consolidación redes de contacto entre la Universidad de Chile y centros de investigación reconocidos a nivel mundial.	Permitir el flujo de información y afianzar acuerdos de colaboración con otros centros de investigación.	Universidad de Chile, Facultad de Cs. Agronómicas
28-04-06 / 17-07-06	Colaboración al grupo *Molecular Cell Biology* (*Cardiff University*) en la elaboración de artículo científico que será publicado en alguna revista de alto impacto científico.	Participar como co autor en la elaboración de artículo científico.	Universidad de Chile, Facultad de Cs. Agronómicas
17-07-06 / 04-08-06	Preparación y desarrollo de la Clase de Floricultura: "Biotecnología en la Floricultura".	Entregar un enfoque biotecnológico básico aplicado a la Floricultura a alumnos de la cátedra de Floricultura de la Fac. de Cs. Agronómicas de la U. de Chile.	Universidad de Chile, Facultad de Cs. Agronómicas

SECCIÓN 9. RESULTADOS E IMPACTOS ESPERADOS

El principal resultado de esta actividad de formación será la capacitación de un miembro del grupo de Floricultura de la Facultad de Cs. Agronómicas, U. de Chile, en el uso de herramientas biotecnológicas que permitan conocer los procesos fisiológicos y la expresión de genes involucrados en la senescencia de pétalos y hojas de plantas ornamentales. Se buscará aplicar estas metodologías para reproducir o continuar este tipo de investigaciones en el país y de este modo acercarse a la solución de problemas más concretos que afectan a la floricultura nacional.

La experiencia adquirida por el beneficiario de esta actividad, le permitirá difundir sus conocimientos en el medio nacional, captando el interés de investigadores y académicos del sector floricultor. Estos conocimientos fortalecerán también la consolidación del grupo de Floricultura de la Facultad de Cs. Agronómicas, U. de Chile y permitirán desarrollar nuevas líneas de trabajo, orientadas hacia la biotecnología aplicada en la floricultura.

Además, esta experiencia permitirá establecer y luego consolidar redes de contacto entre la Universidad de Chile y otros centros de investigación reconocidos a nivel mundial, para desarrollar actividades de investigación en conjunto o establecer acuerdos de colaboración. Este tipo de contactos fomentará y enriquecerá el estudio de líneas de investigación asociadas a la biotecnología.

SECCIÓN 11. ANEXOS

ANEXO 1: CURRICULUM VITAE DEL POSTULANTE, INTEGRANTES DEL GRUPO O COORDINADOR EN CASO DE PROPUESTAS GRUPALES

CURRICULUM VITAE

ANTECEDENTES PERSONALES

Nombre	:	**DANILO FERNANDO AROS ORELLANA.**
Fecha de Nacimiento	:	18 de Octubre de 1979.
R.U.T.	:	
Dirección	:	Las Diademas #18.745 Ciudad Satélite Maipú, Santiago.
Teléfono	:	4913378 - 09 5669702
Estado Civil	:	Soltero.
Nacionalidad	:	Chilena.
Edad	:	26 años.
E- Mail	:	daros@uchile.cl

ANTECEDENTES ACADÉMICOS

1986 –1991	:	1° a 6° Básico. "Colegio y Liceo San José", Maipú.
1992 –1997	:	7° Básico a 4° Medio. "Instituto Nacional", Santiago.
1998 – 2002	:	Universidad de Chile. Facultad de Ciencias Agronómicas. Carrera: Ingeniería Agronómica.
2002	:	Grado Académico: Licenciado en Ciencias Agrarias
2004	:	Título Profesional: Ingeniero Agrónomo

EXPERIENCIA LABORAL

Dic. 2001 – Ene. 2002:	Inspector de Semilleros Certificados de Maíz y Maravilla. Servicio Agrícola y Ganadero (SAG), Gobierno de Chile. Asociación Nacional de Productores de Semillas (ANPROS).
Ago. 2003 – Oct. 2003:	Apoyo en el desarrollo de técnicas moleculares. Laboratorio de Certificación Frutal. Facultad de Cs. Agronómicas – Universidad de Chile.
Jul. 2003 – Sep. 2003:	Manejo del césped "Estadio Playa Ancha" Práctica profesional. Ilustre Municipalidad de Valparaíso.
Nov. 2003 – Dic 2003:	Organización de Seminario Internacional de Floricultura Profesor Ing.Agr. M.Sc. Carol Müller. Facultad de Cs. Agronómicas, U. de Chile - FIA
Sep 2004 – Oct 2004:	Organización de Seminario Internacional de Floricultura Profesor Ing.Agr. M.Sc. Carol Müller. Facultad de Cs. Agronómicas, U. de Chile - FIA
Oct 2004 – Nov 2004:	Apoyo en el Desarrollo de Investigaciones en Floricultura. Profesor Ing.Agr. M.Sc. Carol Müller. Facultad de Cs. Agronómicas – Universidad de Chile.
Nov 2004 – Ago 2005:	Apoyo en el desarrollo de técnicas moleculares. Proyecto FONDEF D 03 I 1070. Laboratorio de Certificación Frutal. Facultad de Cs. Agronómicas – Universidad de Chile.
Agosto 2005:	Organización de Seminario Internacional de Floricultura Profesor Ing.Agr. M.Sc. Carol Müller. Facultad de Cs. Agronómicas, U. de Chile - FIA
Sep 2005 – Dic 2005:	Desarrollo de actividades de Investigación. School of Biosciences - Cardiff University. Gales – Reino Unido

AYUDANTÍAS ACADÉMICAS

2002 – I y II Semestre:	Ayudante de Cátedra "Práctica I". Profesora Sra. Gladys Arismendi. Facultad de Cs. Agronómicas – Universidad de Chile.
2002 – I Semestre:	Ayudante de Cátedra "Métodos de Cultivo". Profesora Ing.Agr. Ximena López. Facultad de Cs. Agronómicas – Universidad de Chile.
2002 – II Semestre:	Ayudante de Cátedra "Producción de Cultivos". Profesor Ing.Agr. Ph.Dr. Ricardo Pertuzé. Facultad de Cs. Agronómicas – Universidad de Chile.
2003 – I Semestre:	Ayudante de Cátedra "Genética General". Profesor Ing.Agr. Ph.Dr. Ricardo Pertuzé. Facultad de Cs. Agronómicas – Universidad de Chile.
2003 – I Semestre:	Ayudante de Cátedra "Praticultura". Profesor Ing.Agr. M.Sc. Carol Müller. Facultad de Cs. Agronómicas – Universidad de Chile.
2003 – II Semestre:	Ayudante de Cátedra "Floricultura". Profesor Ing.Agr. M.Sc. Carol Müller. Facultad de Cs. Agronómicas – Universidad de Chile.
2003 – II Semestre:	Ayudante de Cátedra "Producción de Cultivos". Profesor Ing.Agr. Ph.Dr. Ricardo Pertuzé. Facultad de Cs. Agronómicas – Universidad de Chile.
2003 – II Semestre:	Ayudante de Cátedra "Fruticultura General". Profesor Ing.Agr. Dr. Rodrigo Infante. Facultad de Cs. Agronómicas – Universidad de Chile.
2004 – I Semestre:	Ayudante de Cátedra "Praticultura". Profesor Ing.Agr. M.Sc. Carol Müller. Facultad de Cs. Agronómicas – Universidad de Chile.

2004 – II Semestre: Ayudante de Cátedra "Floricultura".
Profesor Ing.Agr. M.Sc. Carol Müller.
Facultad de Cs. Agronómicas – Universidad de Chile.

2005 – I Semestre: Ayudante de Cátedra "Praticultura".
Profesor Ing.Agr. M.Sc. Carol Müller.
Facultad de Cs. Agronómicas – Universidad de Chile.

2005 – II Semestre: Ayudante de Cátedra "Floricultura".
Profesor Ing.Agr. M.Sc. Carol Müller.
Facultad de Cs. Agronómicas – Universidad de Chile.

OTROS ANTECEDENTES

- Dominio del idioma Inglés.
- Manejo y dominio de: Procesador de textos MS-WORDS, Hoja de Cálculo MS-EXCEL, Microsoft Power Point, Internet - diseño y construcción de sitios WEB.
- Experiencia en Formulación de Proyectos de Investigación y Desarrollo a cargo del profesor Ing.Agr. Dr. Rodrigo Infante.
- Experiencia en organización y difusión de Seminarios y Congresos.
- Vinculación y contacto con distintos agentes de la Industria y la Investigación nacional en el área de la Floricultura.
- Tesis de pregrado orientada a la investigación y al desarrollo de técnicas moleculares en el área de la Floricultura.

SEMINARIOS Y CONGRESOS

Jun. 2000: Seminario: "Producción de flores frescas de Lilium y Tulipanes".
Universidad de Las Américas - Facultad de Ciencias Agrarias.
Asistente.

Nov. 2002: Segundo Seminario Internacional: "Mejoramiento Genético de Frutales de Carozo".
Universidad de Chile - Facultad de Ciencias Agronómicas.
Miembro del comité organizador.

Dic. 2002: 53 ^{er} Congreso Agronómico de Chile.
Universidad de Chile - Facultad de Ciencias Agronómicas.
Miembro del comité organizador.

Sep. 2003: Conferencia Fisiología de la Floración: "Quantifying Floricultural Plant Response to the Environment: Flowering and Morphogenesis".
Pontificia Universidad Católica de Chile - Facultad de Ciencias Agrarias.
Asistente.

Oct. 2003: Seminario Internacional de Flores y Bulbos: "Oportunidades de mercado para productores e inversionistas".
Fundación Chile.
Asistente.

Nov. 2003: Seminario Internacional de Carozos: "Actualizaciones en el establecimiento de un huerto moderno".
Asociación Gremial de Viveros Frutales de Chile.
Asistente.

Dic. 2003: Seminario Internacional: "Poscosecha en Flores de Corte".
Universidad de Chile, Facultad de Ciencias Agronómicas – FIA
Miembro del comité organizador.

Ago. 2004: Seminario: "Manejo técnico del cultivo comercial de proteaceas".
Universidad de Talca - Facultad de Ciencias Agrarias.
Asistente.

Sep. 2004: Simposio: "Mejoramiento Genético de plantas nativas".
Pontificia Universidad Católica de Valparaíso - Facultad de Ciencias Agrarias.
Asistente.

Oct. 2004: Seminario Internacional: "Estrategias de Innovación, Promoción y Comercialización para el sector floricultor".
Universidad de Chile, Facultad de Ciencias Agronómicas – FIA
Miembro del comité organizador.

Oct. 2004: II Congreso Argentino de Floricultura y Plantas ornamentales.
Universidad Católica de Buenos Aires, Argentina
Expositor.

Oct. 2004: I Encuentro Latinoamericano de Floricultura.
Universidad Católica de Buenos Aires, Argentina.
Panelista.

Dic. 2004: Seminario: "Avances en Genómica en el área agrícola".
Fundación para la Innovación Agraria.
Asistente.

Ene. 2005: Sixth International Peach Symposium - ISHS Fruit Section
Universidad de Chile - Facultad de Ciencias Agronómicas.
Miembro del comité organizador.

Abr. 2005: Curso: "Producción de Flores de Corte"
Carrera de Post grado en Horticultura (Magister Scientiae)
Universidad Nacional de Cuyo, Facultad de Ciencias Agrarias– INTA

Ago. 2005: Seminario Internacional: "Buenas Practica Agricolas en el Sector Floricultor".
Universidad de Chile, Facultad de Ciencias Agronómicas – FIA
Miembro del comité organizador.

Nov. 2005: Visita Tecnica: "International Hortifair"
Amsterdam - Holanda

PUBLICACIONES Y PONENCIAS

AROS, D. y MÜLLER, C. 2003. Panorama actual de la poscosecha en la floricultura Chilena. In: Seminario Internacional: Poscosecha en flores de corte. Santiago, Chile.
Disponible en: http://agronomia.uchile.cl/webcursos/floricultura/congreso/carol.pdf

AROS, D. y MÜLLER, C. 2004. Panorama actual de la floricultura chilena en el ámbito del mercado y la comercialización. In: Seminario Internacional: Estrategias de innovación, promoción y comercialización para el sector floricultor. Santiago, Chile.
Disponible en: http://146.83.42.188/claroline/document/document.php

AROS, D., MENESES, C. e INFANTE, R. 2004. Comparación de accesiones comerciales y silvestres de alstroemerias a través de descriptores morfológicos y marcadores moleculares (RAPDs). 110-112 p. In: Instituto Nacional de Tecnología Agropecuaria. II Congreso Argentino de Floricultura y I Encuentro Latinoamericano de floricultura, Buenos Aires, Argentina. 26 de Octubre de 2004. 349 p.

AROS, D. 2004. Panorama actual de la investigación en la floricultura en Chile. s.p. In: Instituto Nacional de Tecnología Agropecuaria. II Congreso Argentino de Floricultura y I Encuentro Latinoamericano de floricultura, Buenos Aires, Argentina, 29 de octubre de 2004.

AROS, D., MENESES, C. and INFANTE, R. 2005. Genetic diversity of wild species and cultivated varieties of alstroemeria estimated through morphological descriptors and RAPD markers. Enviado abr. 2005. Aprobado sep 2005. Scientia Horticulturae.

INFANTE, R., KRAEMER, F., LUCHSINGER, L., MENESES, C. and **AROS, D.** 2005. Sensory postharvest quality evolution in apricot (Prunus armeniaca L.) cvs. 'Palsteyn' and 'Grandir'. In: XIIIth International Symposium on Apricot Breeding and Culture, Murcia, España, 13-17 de junio de 2005.

REFERENCIAS

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ARGENTINA
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Director del Instituto de Floricultura IF, INTA
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dmorisigue@cnia.inta.gov.ar

BREVE CRONOLOGÍA ACADÉMICA Y LABORAL

Mi experiencia en el área de la Biotecnología y la Floricultura comenzó el año 2002, con mi memoria de título: "Comparación de accesiones comerciales y silvestres de alstroemerias a través de descriptores morfológicos y marcadores moleculares". Esta memoria permitió estimar la diversidad genética entre genotipos silvestres de alstroemeria y variedades actualmente cultivadas y mejoradas en base al material genético nativo. El año 2004 tuve la posibilidad de exponer este trabajo oralmente en el "II Congreso Argentino de Floricultura y Plantas Ornamentales y I Encuentro Latinoamericano de Floricultura", donde también participé como Panelista exponiendo la situación actual de la Investigación en el tema de Floricultura en Chile. Además, durante este año preparé el artículo científico: "Genetic diversity of wild species and cultivated varieties of alstroemeria estimated through morphological descriptors and RAPD markers", que fue aceptado en septiembre por la prestigiosa revista "Scientia Horticulturae". Tambien está en desarrollo la preparación del trabajo: "Effect of gamma irradiation on Alstroemeria aurea G. in vitro rhizomes, an approach to the appropriate dosage for breeding purposes", que pronto será enviado a alguna revista de interés científico.

Siguiendo en el tema de Floricultura y Biotecnología, actualmente soy colaborador de la memoria de título: "Efecto de la estratificación de embriones y escarificación de semillas sobre el crecimiento de Alstroemeria spp. in vitro", que tiene por finalidad desarrollar un protocolo de germinación in vitro de embriones, que permita realizar un sistema eficiente de propagación de alstroemerias nativas. El material ha sido tomado del pequeño banco de germoplasma de alstroemerias nativas establecido en un invernadero de la Facultad, en donde también se han realizado algunos cruzamientos interespecíficos.

Ademas, destaco mi activa participación en la cátedra de Floricultura durante los tres ultimos anos, dictando algunas clases y coordinando algunas practicas a cargo del Sr. Carol Müller. Tambien, con el patrocinio de la Universidad de Chile y el financiamiento de FIA, he participado en la exitosa realizacion de tres Seminarios Internacionales de Floricultura donde se han abarcado temas de interés para el sector. En este contexto, se plantea la posibilidad de conformar un nuevo grupo de trabajo en la Facultad, orientado al desarrollo de investigaciones en el tema de Floricultura, con especial énfasis en la aplicación de herramientas biotecnológicas y el Mejoramiento Genético. Durante el último año, se han desarrollado tres memorias de título en el tema y algunas otras están en desarrollo,

Mi último trabajo estuvo ligado al Proyecto FONDEF D03I1070: "Mejoramiento de la competitividad del damasco de exportación, mediante la diferenciación del producto y la organización de la industria", en el Laboratorio de Mejoramiento Genético y Certificación Frutal de la Facultad de Ciencias Agronómicas de la Universidad de Chile. Mi labor estuvo orientada al desarrollo de una selección asistida a través de marcadores moleculares (MAS) con el objetivo de obtener nuevas variedades de damascos con caracteres de interés para satisfacer la demanda de la industria nacional. En este sentido, se comenzó con un trabajo de extracción de ADN de 35 genotipos de damascos (variedades e híbridos obtenidos en el programa), para luego desarrollar el protocolo de amplificación por PCR con microsatélites para estimar la diversidad genética del material. Además,

trabaje con partidores específicos que según la literatura, estarían asociados al gen "S-allele" de la autoincompatibilidad en damasco, de este modo, se podrán identificar y seleccionar precozmente genotipos provenientes del programa de mejoramiento genético en función de su carácter de autocompatibilidad, sin necesidad de esperar su floración.

Finalmente, desde septiembre de este año desarrollé algunas actividades de investigacion durante tres meses en Cardiff University, School of Biosciences, a cargo de la Dr. Hilary Rogers.

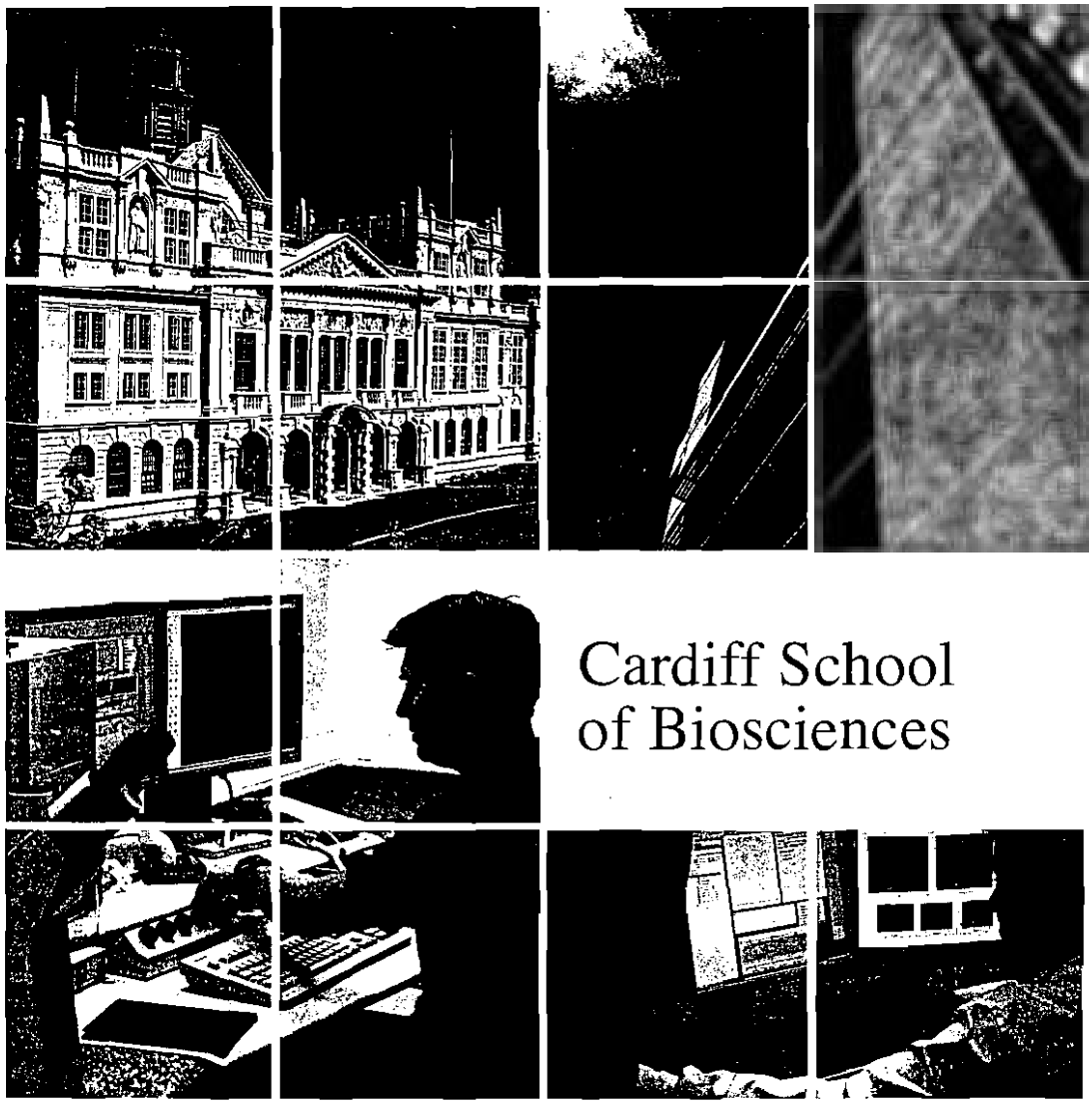
ANEXO 2: FICHA DE ANTECEDENTES RESUMIDA DEL POSTULANTE O DE LOS PARTICIPANTES EN CASO DE PROPUESTAS GRUPALES

FICHA DE ANTECEDENTES PERSONALES RESUMIDA	
ANTECEDENTES PERSONALES	
Nombre completo	DANILO FERNANDO AROS ORELLANA
RUT	
Número de Pasaporte	
Fecha de Nacimiento	18 de octubre de 1979
Nacionalidad	Chilena
Dirección particular	Las Diademas 18745 – Ciudad Satelite – Maipu - Santiago
Fono particular	2-4913378 / 9-5669702
Fax particular	
Dirección comercial	Santa Rosa # 11315, La Pintana - Santiago
Fono y Fax comercial	9785717
Banco y número de cuenta corriente para depósito de fondos correspondientes	
Nombre y teléfono de la persona a quien avisar en caso de emergencia	Thamara Orellana Andrade 4913378
Descripción de la principal fuente de ingreso	Facultad de Ciencias Agronómicas – U. de Chile
Ultimos cursos o actividades de formación en las que ha participado	Abr. 2005: Curso: "Producción de Flores de Corte". Carrera de Post grado en Horticultura (Magister Scientiae). Universidad Nacional de Cuyo, Facultad de Ciencias Agrarias– INTA Ago. 2005: Seminario Internacional: "Buenas Practica Agricolas en el Sector Floricultor". Universidad de Chile, Fac. de Cs. Agronómicas – FIA (Miembro del comité organizador). Sep – Dic 2005: Desarrollo de actividades de Investigacion. School of Biosciences - Cardiff University. Gales – Reino Unido

ACTIVIDAD PROFESIONAL Y/O COMERCIAL (ACTUAL)	
Nombre y RUT de la Institución o Empresa a la que pertenece	UNIVERSIDAD DE CHILE Facultad de Ciencias Agronomicas
Cargo	Profesor Ayudante
Antigüedad	1 mes
Resumen de las labores y responsabilidades a su cargo	Encargado de dictar algunas cátedras de Floricultura y coordinar salidas a terreno
Otros antecedentes de interés	
ACTIVIDAD COMO AGRICULTOR (ACTUAL)	
Tipo de Agricultor (pequeño, mediano o grande)	
Nombre de la propiedad en en la cual trabaja	
Cargo (dueño, administrador, etc.)	
Superficie Total y Superficie Regada	
Ubicación (detallada)	
Rubros a los que se dedica (incluir desde cuando se trabaja en cada rubro) y niveles de producción en el rubro de interés	
Resumen de sus actividades	
Organizaciones (campesinas, gremiales o empresariales) a las que pertenece y cargo, si lo ocupa	

ANEXO 3: ANTECEDENTES DE LA INSTITUCION QUE EFECTUA O DICTA LA ACTIVIDAD DE FORMACIÓN

CARDIFF UNIVERSITY
PRIFYSGOL CAERDYDD



Cardiff School of Biosciences

Postgraduate
Research Opportunities

Welcome

Professor John L. Harwood

Welcome to the Cardiff School of Biosciences. As Head of School, I am part of an exciting, innovative and diverse teaching and research environment that spans the full range of biology from whole (eco) systems to molecular biology and protein structure.

The School is one of the largest biological science departments in the UK, providing a rich and multidisciplinary environment in which to study and work.

The School has six research groups: Connective Tissue Biology; Genetics; Molecular Cell Biology; Neuroscience; Biodiversity and Ecological Processes and Microbiology that collectively attract tens of millions of pounds of research funding annually.

The School plays an important role in the Cardiff Institute of Tissue Engineering and Repair, (CITER), a world-class research centre that studies tissue repair and wound healing. It also includes the internationally-renowned Common Cold and Nasal Research Centre which researches on new medications for the treatment of common cold, influenza and hay fever.

The reputation of the School is reflected in the level of research funding that it attracts annually. Major research sponsorship comes from the science research councils, charities such as the Wellcome Trust, the Arthritis Research Campaign, Cancer UK and many industrial clients.

The School has excellent facilities that contribute to its high quality research and teaching. A new £14 million Life Sciences Building has been constructed to complement the already impressive range of well-equipped laboratories and libraries at the School.

The School of Biosciences has around 100 academic staff, over 100 research staff and around 160 postgraduates, as well as over 1600 undergraduate students.

Supported by world-class facilities, the Cardiff School of Biosciences is able to provide major research opportunities and, if you choose to come to Cardiff, I am certain you will find the experience both rewarding and enjoyable.

John Harwood

Professor John L. Harwood
Head of School

About Cardiff

Top left: Cardiff Bay.

Bottom left: The Millennium Centre.

Main image: Cardiff Castle and the Millennium Stadium.

Cardiff is one of Europe's youngest capital cities. Compact, green, friendly and full of life, it provides a first class environment in which to live and study.

As the capital city of Wales, Cardiff has an impressive range of leisure, sporting and cultural amenities. Attractions include the magnificent Millennium Stadium, which hosts many major sporting events, the historic Cardiff Castle, the National Gallery of Wales with its collection of Impressionist paintings, Cardiff International Arena and the recently constructed Millennium Arts Centre.

The University is housed in the centrepiece of one of the world's finest civic centres, an area of prestigious buildings, gardens and broad avenues. The civic centre is set around two parks and within strolling distance of the River Taff, which flows south into Cardiff from the Brecon Beacons National Park. The School of Biosciences is only a ten minute walk from the city's main shopping and entertainment area.

Cardiff is a vibrant city with world class attractions, a thriving cultural scene and a diverse mix of entertainment, restaurants and bars. The city is also famous for its shopping, with almost the whole centre made up of 'pedestrian only' streets, modern shopping arcardes such as the Queens Arcade, St David's Shopping Centre and the Capitol Shopping Centre, and quaint Victorian and Edwardian arcades all within easy walking distance from the University.

Unlike many other cities, Cardiff is not part of a major conurbation and offers easy access to the countryside, coast and mountains. The Brecon Beacons National Park is only a 30 minute drive from Cardiff and the Glamorgan Heritage Coast and the Gower are within easy reach. The city is also easily reached by road or rail from other parts of Britain. Cardiff Airport has frequent connections to Europe and further afield.

Independent researchers who examined factors such as the cost of living, crime rate and shopping facilities, concluded that Cardiff offers a higher quality of life than any other established university city in England and Wales.

Cardiff - the University

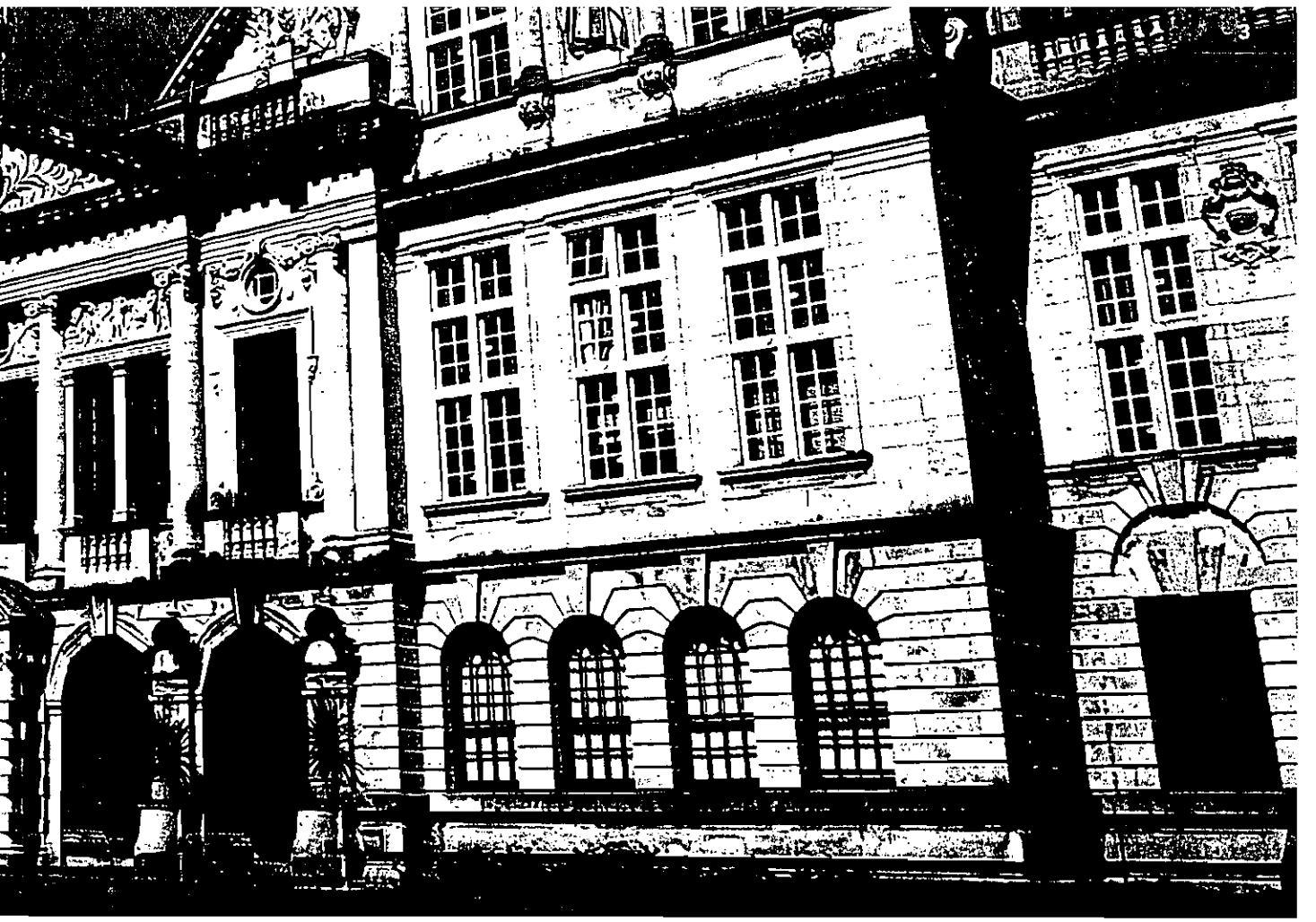
Students have access to the latest information technology.

Cardiff University was founded in 1883 and is one of Britain's leading research universities, ranking seventh in recent league tables of the top 100 research performers. We also have a very strong track record in teaching: we achieved an "excellent" rating in 21 subject areas in the most recent Teaching Quality Assessment Exercise – one of the strongest records of any university in the UK.

In style, Cardiff is a civic university, housed mostly in restored 19th century Portland stone buildings on the edge of central Cardiff. It is also the largest university in Wales. The University's strong and valued relationships with the local and regional communities are the foundation stones upon which our global vision is based. The Cardiff University community is a world-wide one, as indicated by the breadth of our international links and the impact of our work internationally. This serves only to strengthen the importance we attach to the local communities of which we form an important part, whether within the city of Cardiff or throughout Wales.

Cardiff University has a population of 25,000 students, of whom some 5,000 are postgraduates. Inclusiveness and diversity are among our cherished values and the University has a good record of welcoming students from a wide range of social, ethnic and other backgrounds, attracting students from more than 100 countries. The University attracts substantial funding from the research councils, public bodies, industry, commerce and other sources.

In recent years, more than £160 million has been invested in the University estate. Cardiff has first class library and information technology resources, excellent lecture theatres and private

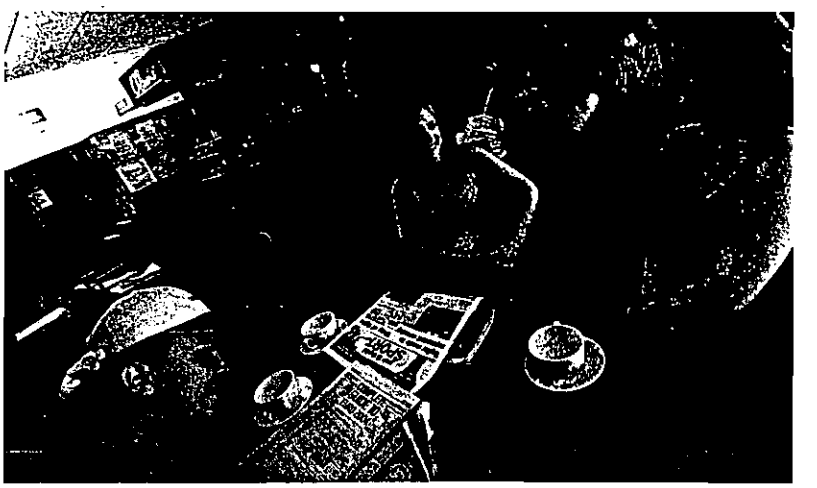


study areas, a number of new residences and extensive sports facilities. All overseas postgraduates are guaranteed a place in University accommodation.

Student Life & Societies

The Students' Union, which sits on the main campus, is one of the largest and most energetic in Britain. It is home to over one hundred clubs and societies, a series of bars, eating places, shops, a travel centre, student advice centre, banks and, six nights a week, a students-only disco. The Unistaff Employment Service helps students, both postgraduate and undergraduate, find casual employment around the university.

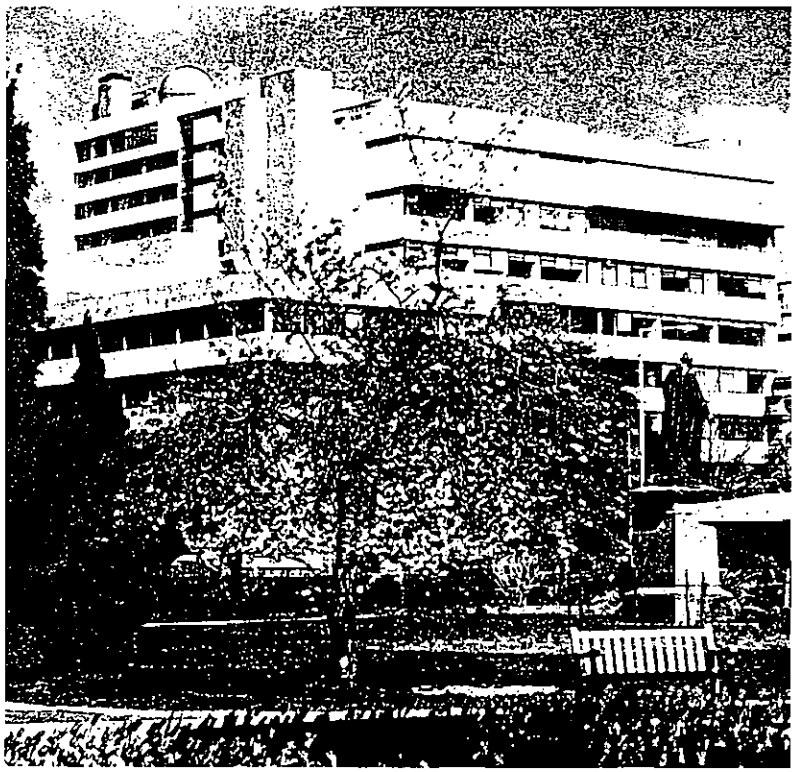
The Students' Union building also houses the Graduate Centre, a dedicated facility for Cardiff's postgraduate community. The Graduate Centre offers additional resources in terms of space, study and social facilities, skills workshops and events for postgraduate research and taught students during their time in Cardiff. These include an induction programme at the start of each academic year to help new students find their way around the campus and city, and workshops on topics such as Time and Stress Management, Presentation Skills and Career Management. Social events range from discos to day trips, many of which are planned by postgraduates themselves.



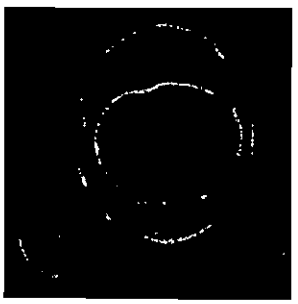
Centre: Main Building.

Above: The Graduate Centre.

Cardiff School of Biosciences - A Pioneer of Excellence



The Biomedical Sciences Building, located at the heart of the University campus.



Budding Yeast.

As a postgraduate student at Cardiff, you will benefit from studying in a dynamic research environment, alongside staff who are working at the frontiers of knowledge in their disciplines. This research culture generates an exciting learning community, reinforces the University's links with industry and commerce, and contributes to students' future career development.

As a major research-led university, Cardiff receives financial support for its research infrastructure and projects from the Research Councils, charities, the European Commission, industry and other sources. The University holds a central position in the business life of Wales, with strong links to influential national and international bodies, funders and users of research. The University's annual income from research grants, contracts and consultancy activity exceeds £70 million, of which income from industry and commerce is approximately £10 million. During a typical year, the University has contracts with more than 300 companies and there are many additional research or consultancy arrangements with government departments, local authorities,

The School is one of the major academic research departments in the University and is currently responsible for generating over 20% of the University's research grant and contract funding. Our established research groups, supported by an excellent research infrastructure, provide the breadth, diversity and topicality for quality postgraduate research. Major research sponsorship comes from the science research councils, charities such as the Wellcome Trust, the Arthritis Research Campaign, Cancer Research UK, and many industrial clients.

The School has excellent facilities that contribute to its high quality research and teaching. A new £14 million Life Sciences Building has been constructed to complement the already impressive range of well-equipped laboratories and libraries at the School. Cardiff School of Biosciences is able to offer major opportunities to postgraduates. A wide spectrum of funding sources support the broad range of research activities that are pursued by over 100 academic staff, 100 externally funded researchers and 160 postgraduate research students. Postgraduates enjoy a full range of training opportunities that are designed to support their progression to the award of a higher degree and provide excellent opportunities for those who wish to pursue careers in universities, research institutions, industry and the public authorities, both at home and abroad.

Graduate Schools

The Graduate Schools at Cardiff exist to foster an intellectually stimulating environment through a programme of events and activities where students are encouraged to share and develop research interests with peers from other schools, and to feel part of a wider research community. The Graduate Schools also provide mid-level skills training which is complementary to the generic programme offered by the Graduate Centre and the discipline-specific, specialist training provided by academic schools.

All postgraduate students in the School of Biosciences are automatically members of the Graduate School in Biomedical and Life Sciences. Students are also encouraged to

take part in interdisciplinary activities that span subject areas and Graduate Schools in order to broaden their research experience.

Biosciences Postgraduate Group

The Biosciences Postgraduate Group is run by the postgraduate students and can provide general advice and guidance on many issues relating to postgraduate education. The group acts as the forum for communication between postgraduates during the course of their training and meets on a regular basis with the Postgraduate Research Leader. The Group elects its own chairperson and is responsible for drafting the formal agenda and minutes of meetings which are then reported to the School's Postgraduate Board.

The Group has also done much in terms of provision of advice to students and greatly encouraged the integration of postgraduates and staff within the Cardiff School of Biosciences at both social and scientific level.

Above: Life Sciences Building.

Left: The Spring Ball.

Student Societies

Cardiff School of Biosciences has a number of student societies. The societies organise social events and lectures. The Societies are:

- The Neuroscience Society
- The Biomedical Society
- The Microbiology Society
- WildSoc
- The Anatomical Society

These societies aim to provide an opportunity for undergraduates, postgraduates and staff to mix socially. Events include cheese and wine evenings, pub quizzes, pub crawls and a spring ball.

Postgraduate Research Opportunities

Student working at our field centre at Llysdinam.

Cardiff is one of Britain's leading research universities, ranked 7th out of 106 UK universities in the 2001 Research Assessment Exercise (RAE).

The Cardiff School of Biosciences pursues an exciting range of cutting edge research within two broad disciplines: Ecology and Environmental Biology, and Mammalian and Biomedical Research. Staff within these two broad areas belong to one of six research groups, each led by a dynamic research-active individual. All research groups have internationally competitive researchers covering a wide range of cutting edge research topics (details on the following pages).

- Biodiversity & Ecological Processes
- Connective Tissue Biology
- Genetics
- Microbiology
- Molecular Cell Biology
- Neuroscience

The School offers opportunities for full-time and part-time research leading to the degrees of PhD or MPhil. Supervision is available across a wide range of research topics in science. Applicants are encouraged to visit the School website for more detailed information on research groups and staff research interests. The School website can be found at www.cardiff.ac.uk/biosi/

The School offers a number of research studentships each year, to provide outstanding applicants with tuition fees and stipends to help cover living expenses. When available, these studentships are advertised on the School website.

The School of Biosciences also houses the Common Cold Centre and Healthcare Clinical [illegible] scientists involved in clinical trials sponsored by the pharmaceutical industry. Each year over one thousand patients participate in clinical trials to examine the efficacy of new treatments for self-medication of common cold, flu, acne, headache and period pains. The Centre also conducts clinical research to understand the symptoms of upper respiratory tract infection and has close collaboration with clinical studies at the Department of Otolaryngology at the University Hospital of Wales.

MRes and Four Year PhD

In addition to the traditional three year postgraduate degree, the School now offers a 4 year PhD programme and a new Master of Research (MRes) degree.

The Frontiers in Bioscience is a four year PhD programme in Inter-disciplinary Biology. This programme will train postgraduate students in state-of-the-art research techniques and promote inter-disciplinary collaborative research between biological and non-biological scientists. Our objective is to produce the next generation of scientific research leaders with exemplary skills in both traditional and post-genomic biological techniques, coupled with excellence in chemistry, physics and mathematics.

The MRes in Bioscience is a twelve month course comprising taught modules and a laboratory based research project. It aims to provide an enhanced education in biological research. It is envisaged that this course will start in October 2006, subject to final validation. Further information can be found on the website at www.cardiff.ac.uk/biosi

Funding Your Studies

The School of Biosciences offers a number of studentships each year which are advertised on our website: www.cardiff.ac.uk/biosi/. We also welcome applications from students with their own source of funding.

Additional Sources of Funding

Overseas Research Students Awards Scheme
International students may be eligible to apply for this scheme. The awards cover the difference between the normal tuition fee for a home (UK) student and the fee charged to overseas postgraduate students. They do not make any provision for living costs. Applications for ORS awards are judged on outstanding merit and research potential. Details and application forms may be obtained from the School of Bioscience Postgraduate and Research Office, or see www.universitiesuk.ac.uk/ors

Dorothy Hodgkin Postgraduate Awards
This prestigious new scheme provides full support (tuition fees and stipend) for overseas students. More information is available from Research Councils UK.
www.rcuk.ac.uk/hodgkin/

Commonwealth Scholarships
Candidates from Commonwealth countries (other than the UK) may be eligible to apply for a Commonwealth Scholarship, which provides support for tuition fees, travel and maintenance costs.
www.csfp-online.org/hostcountries/uk/

The British Chevening Scholarships
These are awarded to extremely able students with preference given to those already established in a career. Awards may cover all or part of the costs.
www.chevening.com/

Further Information
Further information, including details of regional, country and discipline specific scholarships, can be found in the Cardiff University postgraduate funding web pages.
www.cardiff.ac.uk/postgraduate/pgfunding

Working During Your Studies

Cardiff University students have the option of enrolling with the Unistaff Jobshop, run by the Students' Union, which offers opportunities for casual employment in the University and can put you in touch with employers in the Cardiff area. You can also check out the Careers Service vacancy bulletin.

There are plenty of opportunities for students wanting part-time work in Cardiff, usually in shops, bars and restaurants. Your success in finding suitable work will depend on factors such as the flexibility of your study hours and whether or not you have work experience.

International students from a country outside the European Economic Area (EEA) are no longer required to obtain permission to work but are subject to some restrictions, including being limited to a maximum of 20 hours per week in term time (unlimited hours during university vacations).

Working while studying can help to cover your expenses, but you must take care to balance your time between study, work and relaxation.

Tuition Fees

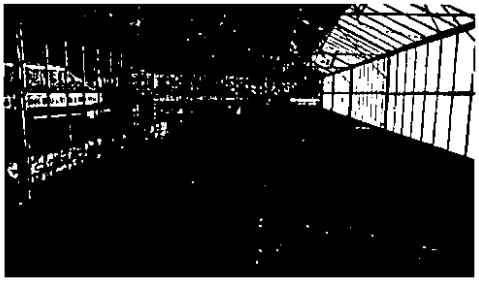
Details of current tuition fees for postgraduate study can be found at:
www.cardiff.ac.uk/postgraduate/pgfees

Cost of Living

Cardiff is one of the cheapest cities in the UK. In a recent newspaper campaign it was discovered that Cardiff is the most cost-effective of all the old University cities. This means that your money will go substantially further than in other places in the UK.

It is estimated that students studying in Cardiff will need approximately £8,000 for one year. These are minimum costs based on a single student living in University-owned self-catered accommodation. This estimate includes accommodation, daily subsistence, local travel, clothing, insurance and study-related items.

Biodiversity & Ecological Processes Group

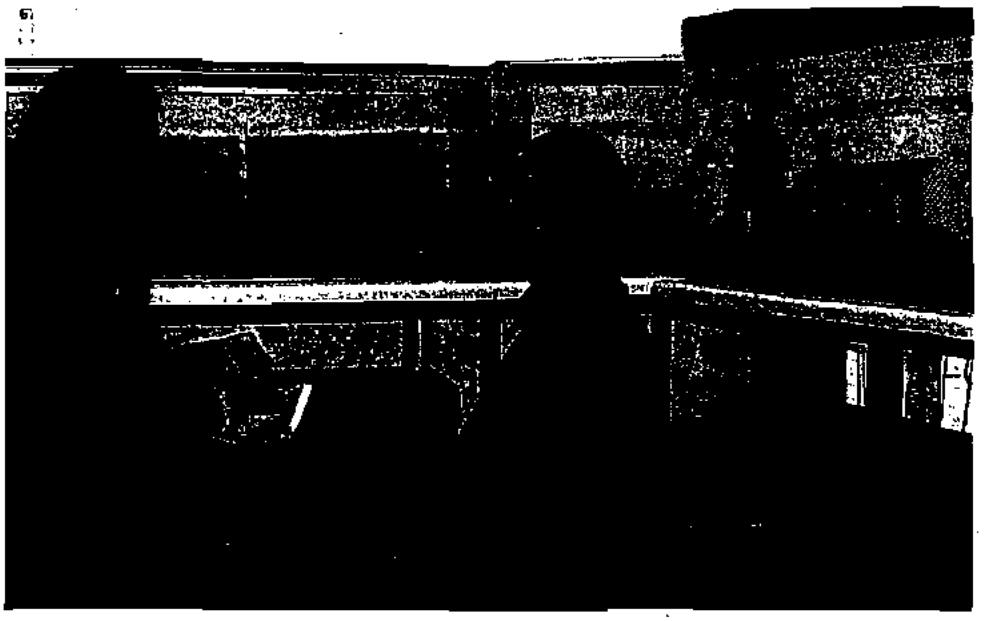


The greenhouse at Llysdinam Field Centre.

The Biodiversity and Ecological Processes Group (BEPG) focuses on the study of ecological and evolutionary processes in animals, plants and microbes. Our aim is to understand the ecological, behavioural and genetic consequences of environmental change on biodiversity. Environmental change in the short term, caused by human-mediated habitat loss, pollution and climate change, poses a special challenge to today's biologists. Our approach is to focus on processes and prediction, combining ecological and molecular approaches in contrasting groups of organisms. Longer term change relates to fundamental evolutionary processes, including adaptation and diversification which result in subtle changes to ecosystem structure and function over time. We examine these processes with a view to understanding, conserving and managing the resulting diversity.

Llysdinam Field Centre has been part of Cardiff University since 1970 when the site was first leased from the Llysdinam Trust. The Centre has both a teaching and research role, being used for Field Courses, and is the base for 14 full time staff. Current research centres on biomass crops using on-site facilities such as laboratories and greenhousing and up to twenty field sites scattered throughout Wales. As of 2005 we have 3 PhD students, 3 Post docs, 1 admin and 4 part time field assistants working on both the husbandry and ecology of short rotation willow, cardoon and rhizomatous perrennial grasses such as Miscanthus, Reed Canary grass (Phalaris arundinaceae), Giant Reed (Arundo donax) and Switch grass (Panicum virgatum).

Thirty years research into amphibian ecology is continued in a PhD study into amphibian phenology and one postdoctoral student and one PhD student part based at the Centre are investigating aspects of otter (Lutra lutra)



Left: Aquarium for experimental studies of wild populations.

pathology and genetics. Other research interests include migrant passerines, bats and freshwater crayfish. Students based at the Centre are free to travel to and from Cardiff as often as they wish to attend courses and lectures and all attend one or more foreign conferences during their studies.

The Biodiversity and Ecological Processes Group has large and expanding facilities, such as the aquarium pictured above, for experimental studies of wild populations. Drs Joanne Cable and Sian Griffiths study fish populations from both a parasitological and behavioural perspective. Both faculty members combine studies of wild populations in the field with laboratory analysis which allow them to directly test fundamental hypotheses formulated from field observations. Molecular ecology also forms a core component of the Group's work, and is a significant element of the work of many members of staff.

Research Areas

- Fungal ecology.
- Soil ecology.
- Conservation biology.
- Understanding genetic diversity above and below the species level.
- Ecotoxicology in aquatic and terrestrial environments.
- Pest management.
- Community ecology.
- Interactions between organisms and their food resources.
- Behavioural ecology.
- Chemical ecology.
- Population dynamics in freshwater systems.
- Predator-prey and host-parasite interactions.
- Evolutionary ecology.
- Fish ecology.

For details of ongoing collaborations, please visit the webpages of individual Biodiversity and Ecological Processes Group members,
www.cardiff.ac.uk/biosi/research/biodiversity/index.html

Connective Tissue Biology

Cell sorting using a new fluorescence activated cell sorter.

Osteoarthritic Synovial joint showing cartilage degeneration.

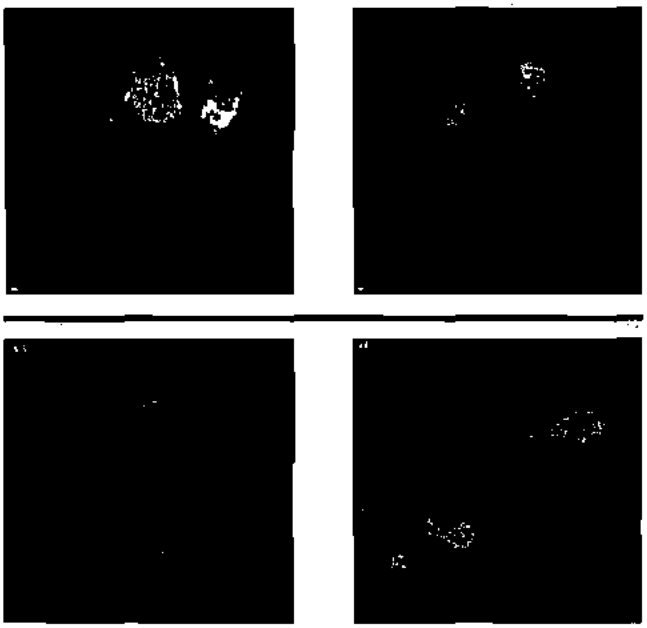
Research in the Group centres around musculoskeletal tissues, particularly in relation to cell and matrix biology in development, ageing and pathology. A particular focus is the biology of the synovial joint as an integrated organ of differing tissue types and how these may interact during pathogenesis of degenerative joint diseases.

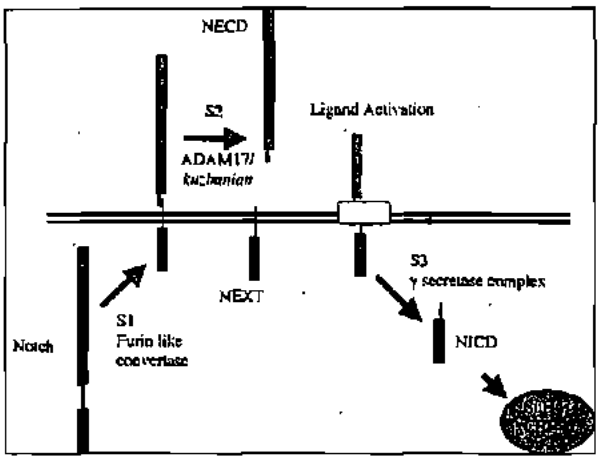
Members of the Connective Tissue Biology Group are all members of the Cardiff Institute of Tissue Engineering and Repair (CITER). CITER is an interdisciplinary virtual Institute that spans numerous cognate departments that have interests in all aspects of tissue engineering and reparative biology. Within the Connective Tissue Biology Group these interests include the repair of tissues such as cartilage, tendon and ligament and intervertebral disc. More recently, the potential use of stem cells in regenerative medicine is also being actively pursued, particularly in relation to articular cartilage. You can visit the CITER website at www.citer.org/indexnf.asp

Cell signalling in tendon cells.

Research Areas

- Development of synovial joints and the cell biology of normal and osteoarthritic cartilage.
- Cell and molecular biological aspects of cartilage repair.
- Structure, function and development of ligaments and tendons - a cell biological, biochemical and molecular approach.
- Structure, function and metabolism of connective tissue proteoglycans in health and disease; biochemical changes in cartilage metabolism (synthesis and degradation) leading to the onset of joint pathology.
- Interactions of cartilage collagens and their role in matrix assembly and integrity in development and disease.
- Biochemistry and molecular biology of collagens in bone growth and inherited skeletal diseases.





Above: Cell signalling mechanisms involved in cartilage development.

Left: Cytoskeletal changes associated with mechanotransduction.

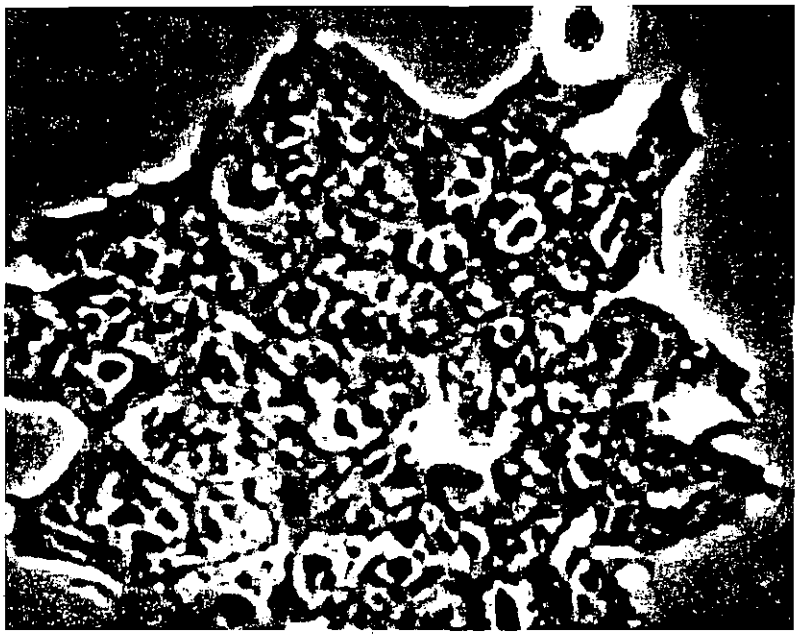
- Regulation of aggrecanases and MMPs by omega-3 fatty acids.
- Transgenic approaches to understanding cartilage pathology.
- Mechanisms of mechanotransduction in cartilage and the intervertebral disc.
- Molecular mechanisms underlying bone remodelling and cartilage degradation in vivo.
- The identification of novel candidate genes for use in the control and diagnosis of disorders such as osteoporosis and osteoarthritis.
- Development of fibrocartilage in tendons, ligaments and intervertebral disc, with particular emphasis on the role of the cytoskeleton.
- Connective tissue matrix changes in ageing.
- The mechanism of attachment of tendon/ligament to bone; application to rheumatological, orthopaedic and sports medicine issues.
- Stem cells and connective tissue repair and regeneration.
- The cellular and molecular mechanism responsible for the osteoprotective effects of thiazide diuretics in bone; effects of and the regulation of extracellular ion concentration and transport.

For details of ongoing collaborations, please visit the webpages of individual Connective Tissue Biology Group members, **www.cardiff.ac.uk/biosi/research/connective/index.html**

Genetics

The Genetics group is comprised of 8 staff members, who share an interest in the role of genetics in development and disease. Principally this is addressed by analysing phenotype-genotype relationships in a diverse set of organisms including Drosophila Melanogaster, Xenopus and Mus Musculus. Themes pursued within the group include: refining the use of murine ES cells to manipulate the mouse genome; the study of the genetic and epigenetic basis of both development and cancer across a range of species; the study of mechanisms underlying neurodegeneneration and finally the development of human ES cells for the therapy of disease.

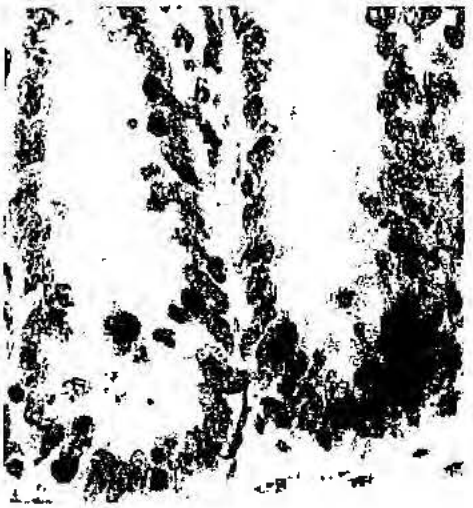
Main Research Themes



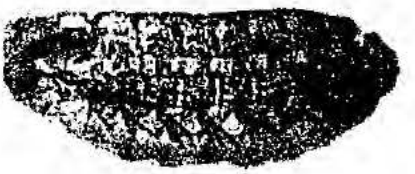
ES cells growing in culture.

Non-cell autonomous induction of muscle (purple) by constitutive-active Nodal/Activin receptor Alk4 (red) in Xenopus ectodermal explants.

- The use of embryonic stem (ES cells, pictured left) cell-based transgenic technologies to study mammalian gene function, with a particular focus on the analysis of gene dysregulation during development and disease.
- The development of new methodologies to enhance transgenesis. This goal is being pursued both through the development of SiRNA technology and through the development of transgenic 'libraries' of mutant alleles using gene trap technology.
- Studying the role of both epigenetics and genetics in determining cancer predisposition and the response to cancer therapy. This is achieved through both conventional transgenesis and conditional (switchable) transgenesis. In particular, the aim is to analyse the in vivo role of a range of different tumour suppressor genes in determining the predisposition to cell death, the response to DNA damage, the mutation burden, genomic stability and the predisposition to neoplasia.
- Functional studies of protein families which are involved in cell signalling and development of the nervous system. We are also trying to reveal connections between dysfunction of these proteins and development of human pathologies, most notably neurodegenerative diseases.
- Cell fate determination, or how initially indifferent embryonic cells decide to adopt their final fate. What determines that some seemingly identical cells of the early embryo become neurons, and others heart muscle or skin? We study these questions in the context of the early development of heart and liver in Xenopus embryos.



Cell death scored by caspase 3 cleavage in the intestine.



The fruit fly Drosphila is used to undertake cell differentiation studies.

- Cell differentiation studied in the fruit fly Drosophila melanogaster, a model organism that historically has shaped our understanding of many aspects of biology.

- The study of neural differentiation of human and mouse embryonic stem cells, and the development of protocols to direct the differentiation of neural progenitors to acquire specific neural fates and phenotypes.

  ES cells are pluripotent; however in chemically defined media their differentiation is restricted towards the neural lineage.

  ES cell differentiation generates naïve neural progenitors and these are highly responsive to extrinsic developmental patterning cues, such as growth factors and morphogens, which can be used to direct their differentiation to acquire specific neural identities. Therefore specific cell types can be derived by a process of applied developmental biology.

- In mammals, some genes, although they are present in two copies, are expressed from only one allele – a phenomenon termed Genomic Imprinting.
  By using BAC transgenes, it is possible to study the consequences of excess expression of these genes. This approach aims to elucidate how epigenetic processes interact to achieve heritable gene silencing using modified BAC transgenes to identify imprint control regions (ICRs) that regulate allele specific expression.

- The study of cell death using cell culture and transgenic approaches, with particular reference to the genetic programmes which control the development and involution of the mammary gland.

For details of ongoing collaborations, please visit the webpages of Genetic Group members, **www.cardiff.ac.uk/biosi/research/genetics/index.html**

Microbiology

Cardiff University has a long established history of strong microbiological research spanning over 40 years. Areas of active research within the Microbiology Research Group now cover aspects of environmental, medical and applied microbiology. Almost all of the Group's projects utilise modern molecular biological approaches, and representatives of all of the major taxonomic groups of micro-organisms, including Bacteria, Archaea, protozoa and yeast, are being studied by researchers in the Group. Current projects are being carried out in collaboration with other research groups in the UK, Europe, the USA, Asia, Australia and New Zealand.

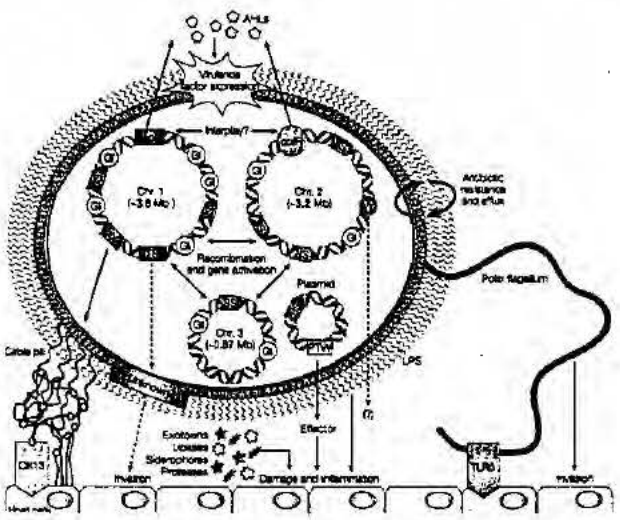
Research Areas

Environmental microbiology

- Molecular ecology of Bacteria and Archaea in aquatic and terrestrial habitats.
- Sub-surface and deep biosphere microbiology
- Ecology of horizontal gene transfer mediated by mobile genetic elements, transduction and transformation.
- Microbial biofilm ecology.
- Non-invasive methods for studying microbial physiology in natural environments.
- Thermophilic aerobic digestion of effluents.
- Biodegradation of pollutants, including chlorinated compounds.

Medical microbiology

- Use of ultrasound in medical diagnostics.
- Role of antiseptics and antibiotics in the management of urinary tract infections.
- Biofilm formation and its genetic control in urinary tract bacteria.
- Oral microbiology; biofilms and biodiversity.
- Epidemiology, pathogenesis and biodiversity of Pseudomonas aeruginosa and Burkholderia cepacia in patients with Cystic Fibrosis.
- Biodiversity and distribution in natural ecosystems of medically important bacteria.
- Cell manipulation and antigen detection in ultrasonic standing waves.



Genomic structure and major virulence factors of Burkholderia cenocepacia. Schematic illustration shows the organism's three chromosomal replicon structure genome.

Applied microbial biochemistry and genetics

- Biophysical approaches to the properties of cell surfaces and membranes.
- Flow cytometric and cytofluorimetric analyses of micro-organisms.
- Control of energy metabolism; oscillations, rhythms and clocks in protozoa
- Biotechnological applications of Bacillus spp.
- Genomics of Burkholderia cepacia.
- Metabolism of the budding yeast Saccharomyces cerevisiae.
- Identification of plant metabolic regulatory genes by genetic screening of yeast.

Recent Research Highlights

Microbial genomics
Postgraduate students in the Microbiology Research Group (MRG) are investigating the biology, epidemiology and virulence bacterial opportunistic pathogens. We employ genetic and genomic research strategies to study several species of bacteria in both the natural environment and disease settings. The prevention of Pseudomonas aeruginosa and Burkholderia cepacia complex respiratory infections in patients with cystic fibrosis are the primary areas of focus.

Molecular Microbial Ecology
Members of the MRG are using molecular biological methods to investigate the diversity of prokaryotic communities and to compare cultivable and uncultivated microbial populations in a variety of ecosystems. This research has led to the understanding that in polluted soils the large diversity apparent in unpolluted sites is masked by the more obvious responses to pollution shown by the culturable population. Our aquatic studies have led to the isolation of many new bacteria from the abundant Bacteroidetes phylum, which are important and widespread aerobic heterotrophs.

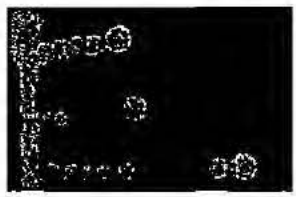
The Deep Subsurface Biosphere
PhD students are studying prokaryotic interactions in deep marine and terrestrial subsurface layers in 200-800m deep cores. These cores have been obtained by our involvement in the International Ocean Drilling Program (IODP), and the drilling research vessel Joides Resolution. In collaboration with others this research has shown for the first time that prokaryotic diversity estimated by 16S rRNA gene based methods is quantitatively linked to depth changes in bacterial numbers, activity and geochemistry within deep marine sediments in the oceanic Peru margin.

Applied Microbiology
In the last year PhD students have established mechanisms for the anti-candidal properties of selected garlic components, diallyldisulphide and allyl alcohol produce apoptotic cell death in this organism without being too toxic to humans. This affords a new way of tackling antibiotic resistance; there are no reported incidents of micro-organisms becoming resistant to the garlic compounds. Continuous-flow cultivation of micro-organisms is used by MRG researchers to study various aspects of microbial physiology and biochemistry.

Chemostat cultures of the budding yeast Saccharomyces cerevisiae are being used to study ultradian-timekeeping, the internal time base upon which all the diverse biochemical events, sequences and processes must be coordinated – essential for the maintenance of the ordered complexity of life. Even though the conditions are kept constant, the oxygen consumption rate of the growing culture oscillates with a period of about 40 minutes.

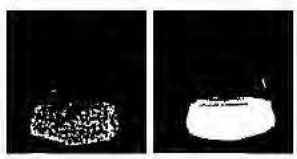
Investigations into the biochemistry and genetics of metabolism of S. cerevisiae, currently being undertaken at Cardiff, have three main thrusts: (1) regulation of metabolism, (2) the cell cycle and morphological development, (3) identification of plant genes which encode global regulators of metabolism by genetic screening in yeast. Molecular biological approaches, along with NMR spectroscopy and GCMS to analyse metabolism, have been used to study the catabolism of amino acids to their respective fusel alcohols (which are important flavour and aroma compounds in all yeast-fermented products) and the role of fusel alcohols in determining hyphal and pseudohyphal development in yeasts.

Yeast exposed to isoamyl alcohol in complex medium stained with Calcofluor white to show formation of filaments.



Colonies of the new bacterial genus Fluvicola taffensis isolated from the River Taff in South Wales.

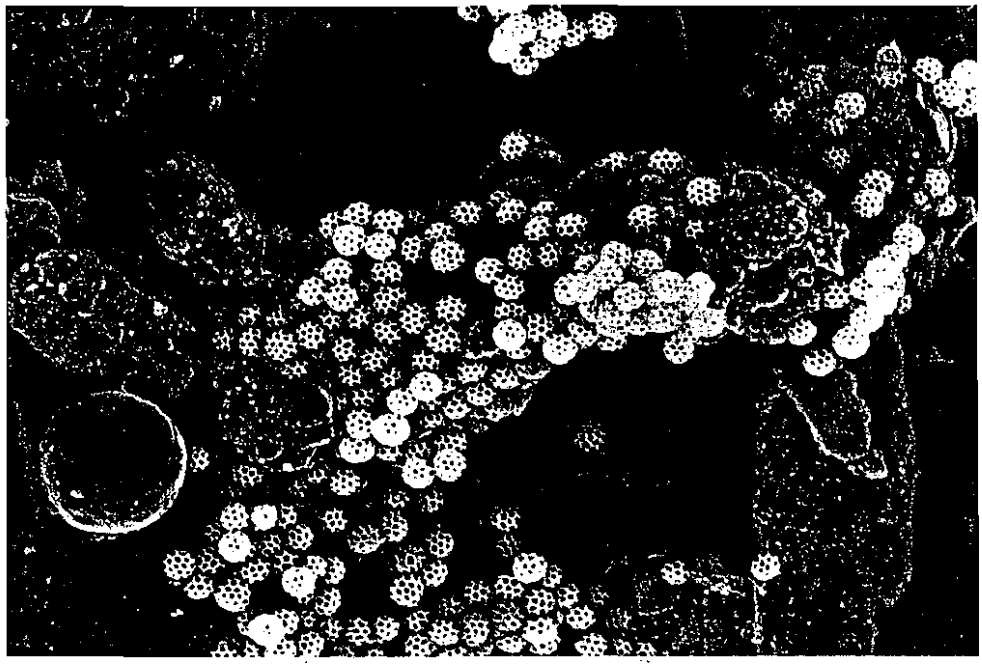
Joides Resolution – research vessel for IODP research and studies on microbial populations in the deep subseafloor sediment.



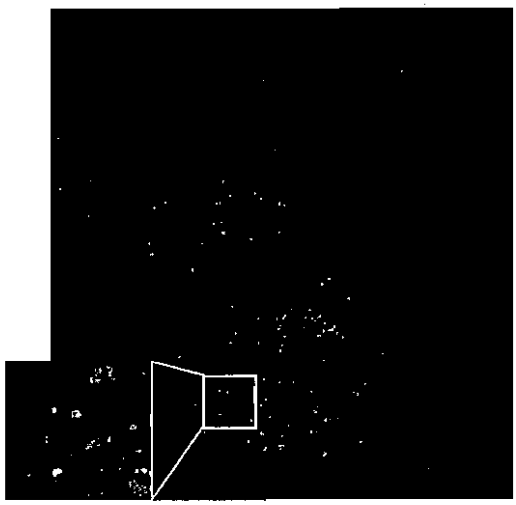
Batch cultures of Photobacterium showing fluorescence – this organism is being grown in continuous-flow culture at Cardiff and is used as a biosensor for detection of toxic compounds.

For details of ongoing collaborations, please visit the webpages of Microbiology Group members, **www.cardiff.ac.uk/biosi/research/micro/index.html**

Molecular Cell Biology



Submicron-sized brochosome particles produced by leafhoppers, adhering to gypsum crystals and pollen grains in an ambient air sample from Lambeth Park Road, Central London.



Dvl-GFP protein (green) in CHO cells counterstained with ant-Lgp B (red) to mark muti-vesicular bodies.

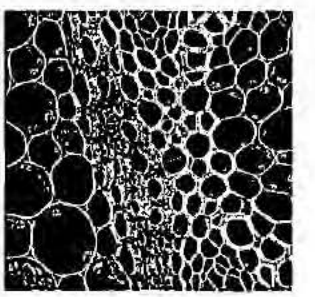
The Molecular Cell Biology (MCB) Research Group encompasses a wide-range of research activity in the basic and biomedical sciences, with a focus on cell signalling, metabolism and toxicity. Members of the group utilize traditional biochemical and cell biological methods in combination with the post-genomic technologies of transcriptomics and proteomics, and are developing new technologies for protein and cell analysis. The Group has extensive collaborations with the other Research Groups within the School, and is the focus of inter-School collaborations with chemistry (Chemical Biology) and physics (Biophotonics).

Molecular model of the interaction of the kinase GSK-3 with Axin.

New confocal microscope imaging facility.

Specific Research Areas

- Transcriptional regulation and mechanisms of the immune response.
- Novel laser-scanning microscopy based on Coherent Antistokes Raman Scattering.
- Inhibitory proteins for the control of proteinases.
- Self-assembling protein-based molecular devices.
- Control of GSK-3 mediated cell signalling and protein complexes.
- Protein based anti-malaria drugs.
- Heavy metal stress, transport and detoxification.
- Lipid metabolism.
- Toxicogenomic studies of airbourne pollutants and human respiratory distress.
- Plant cell biology and control of cell division.
- Dictyostelium chemotaxis and morphogenesis.
- Psychotropic drugs and neuronal growth cone behaviour.
- Fish sex determination and larval metamorphosis.
- Wnt signalling and breast cancer.



Confocal image of plant cells.

For details of ongoing collaborations, please visit the webpages of individual Molecular Cell Biology Group members,
www.cardiff.ac.uk/biosi/research/molecular/index.html

Neuroscience

Fluorescent micrograph of neuronal cell.

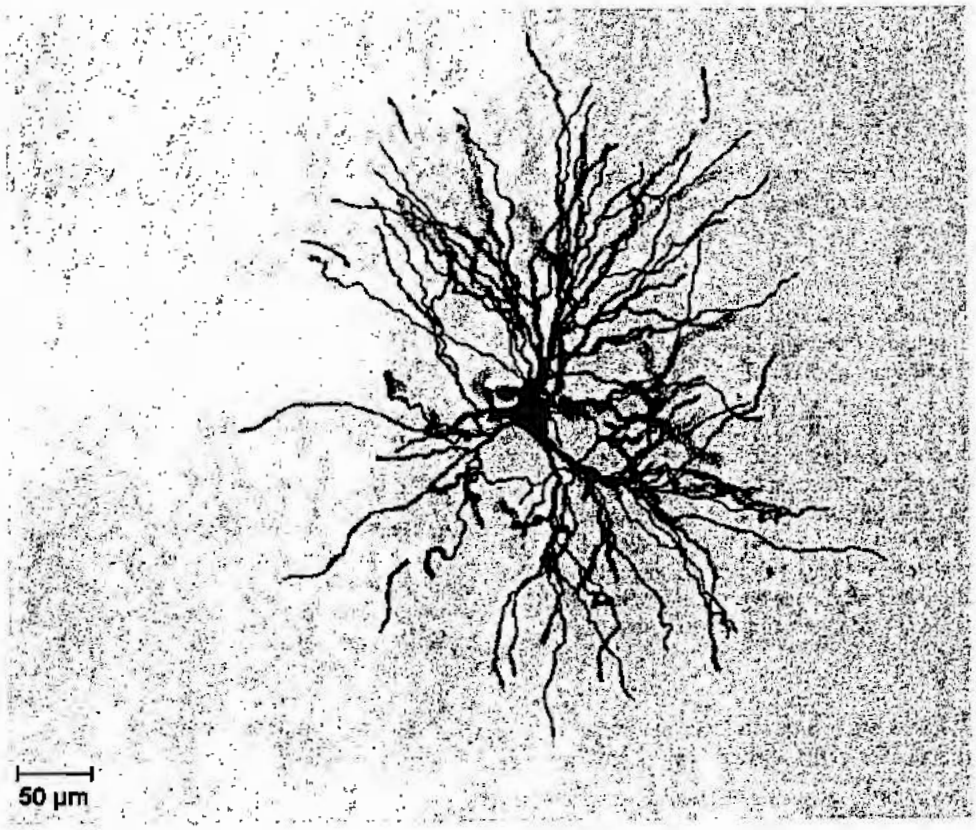
Neuroscience graduate students at Cardiff have access to a wide range of cutting edge research labs, including labs testing neural transplantation methods to treat neurodegenerative diseases such as Huntington's disease.

The Neuroscience Research Group at Cardiff University comprises 13 staff with expertise spanning across the entire range of Neuroscience disciplines. Our aim is to understand how neurones work and hence how systems of neurones carry out complex processes such as sensory perception, learning and memory. Research strengths are focused in three main areas: Neuronal Plasticity, including developmental plasticity and memory mechanisms, Cellular and Molecular Neuroscience and Neuronal Transplantation.

Neuronal Plasticity is a key research area for three members of the Group who use behavioural, systems, cellular and molecular approaches to understand the process of synaptic plasticity and neuronal development. Research in the area of Neuronal plasticity is supported by an MRC co-operative for plasticity, learning and memory, which links the School of Psychology with the School of Biosciences.

Research in Molecular and Cellular Neuroscience links in with research interests in transgenic and knockout technologies. It also links with research in genetics and the Wales Gene Park. Funded by the Welsh Assembly Government and the Department of Trade and Industry, the Wales Gene Park is an exciting and ambitious venture that brings together genetics, life sciences and clinical expertise from across Wales. For more information on the Wales Gene Park specifically, please visit www.walesgenepark.co.uk/

The Neuronal transplantation group is involved in finding therapies for Huntington's and Parkinson's disease, including through the use of stem cells. New opportunities for research in Neuroscience will become available in 2006 for high field MRI scanner and 2-photon imaging. Finally, the Neuroscience group also provides research opportunities in Physiology, including studies on potassium channels and calcium sensing receptors.



Dendritic tree of a Y-type LGn neurone located in the visual system.

Fluorescent micrograph of serotonin receptors (in green) located on motoneurones of the spinal cord (orange).

Specific Research Areas

- Synaptic plasticity in somatosensory cortex.
- Imaging plasticity in the visual system.
- Gene expression in memory consolidation.
- The role of ERK and CREB signalling in hippocampal and striatal plasticity.
- Plasticity of olfaction.
- The role of neurotrophins in cell survival and differentiation.
- Cellular mechanisms in thalamus and thalamocortical systems.
- Computation in dendrites.
- Determinant of gene expression, including in circadian rhythms.
- Neuroendocrinology of ghrelin and growth hormone.
- Repairing striatal circuits with cell transplant methods.
- Development of stem cell strategies for neuronal repair.
- Effects of ageing on spinal autonomic circuitry.
- Ion channels in respiratory health and disease.
- Molecular mechanisms of nutrient sensing.
- Human Olfaction.
- Cell volume regulation.

For details of ongoing collaborations, please visit the webpages of individual Neuroscience Group members,
www.cardiff.ac.uk/biosi/research/neuroscience/index.html

The Application Process

Entry Requirements:

A first or upper second class UK honours degree (or equivalent) in biological and related sciences.

Please note that candidates whose first language is not English will normally be expected to obtain a minimum IELTS score of 6.5 or TOEFL score of 600+.

The School offers opportunities for suitably qualified candidates to study for higher degrees by research. A doctoral degree scheme (PhD) normally consists of three years' full-time supervised study, whilst Masters degrees by research (MPhil) normally entail one or two years of full-time study. There are currently around 100 students working towards their doctorates.

The Application Process:

Postgraduate application forms are available to download from the website,

www.cardiff.ac.uk/postgraduate/pgapply

together with the guidance notes for completing the form, and referee report forms. You can also obtain a hard copy of the form and the postgraduate prospectus from the Postgraduate Office. For informal enquiries, please contact:

The Postgraduate and Research Office
Cardiff School of Biosciences
Cardiff University
Biomedical Sciences Building
Museum Avenue
Cardiff CF10 3US

Tel: +44 (0)29 2087 5243

Fax: +44 (0)29 2087 5211

Email: bioscience-pg@cardiff.ac.uk

The application form, the two references or referee report forms, and a set of supporting papers (photocopies of the degree certificate, the transcript of studies and of letters indicating financial support) should be sent to:

The Postgraduate Admissions Office
The Registry
Cardiff University
PO Box 927
Cardiff CF24 0DE

Equal Opportunities

The University conducts its student recruitment, selection and assessment procedures on an equal opportunities basis. It is committed to ensuring that all applicants, students and employees are treated equally, regardless of their colour, race, ethnic or national origins, gender, sexual orientation, marital status, family responsibilities, physical or sensory disabilities, or their political and religious beliefs.

Applicants with Disabilities/Specific Needs

All offers to study at Cardiff University are made solely on the basis of academic merit. Where applicants have specific requirements that relate to a disability or medical condition, they are encouraged to discuss these with relevant staff in order that appropriate arrangements can be made to ensure the University provides an accessible environment. Specifically, applicants are invited to contact the Disability Adviser who can provide information about the application procedure, course delivery and access to the physical environment. Where appropriate, informal visits can be arranged in which applicants can view accommodation and meet academic staff.

The Disability Adviser can be contacted on the details below:

Dean of Students' Office
50 Park Place
Cardiff CF10 3UA

Tel/Minicom: +44 (0)29 2087 0004

Email: WilliamsME1@cardiff.ac.uk

Hilary Rogers PhD

Cardiff School of Biosciences
Main Building
Museum Avenue
Cardiff CF10 3TL
UK

Tel: +44 (0)29 20 876352/5880
Fax: +44 (0)29 20 876352/5880

Email: RogersHJ@cardiff.ac.uk

Research

My research interests cover several areas including plant reproduction, cell division to cell death, transgene flow from GM plants to bacteria and the use of DNA markers to study plant and fungal populations. I am part of a number of collaborative groups and further information on our projects may be available on the web-sites of my collaborators.

Molecular events during plant reproduction from control of floral determination to floral senescence

A. Floral determination

Silene coeli-rosa: isolation of the LFY homologue

Pharbatis nil: the role of carbohydrates

Allium spp.: investigating bulbil formation

Figure 1: Model and crop species we are using to explore the conservation of floral determination mechanisms

In collaboration with Dr Dennis Francis and Dr RJ Herbert we are exploiting the wealth of knowledge on the control of flowering in the model species Arabidopsis to explore whether orthologous genes are performing the same function in several model and horticultural crop species (Fig 1). For example LFY is an important regulator of the transition to flowering in *Arabidopsis*. Unlike *Arabidopsis*, *Silene coeli-rosa* is an absolute long day (LD) plant: it requires seven LD for 100% flowering. When 28-day-old plants are given this treatment and returned to short days (SD), sepals begin to appear two days later and a complete terminal flower is formed 5 days later. Using precise photoperiodic treatments, we wanted to discover the extent to which a *Silene LFY* (SLFY) would be linked to flowering and to what extent it would be present in vegetative SAMs. We cloned SLFY and found that it was dramatically up-regulated in floral or florally-induced SAMs (Fig 2). Also, analysis of the proximal 5' upstream region revealed interesting potential regulatory sequences. Our other work on early flowering has focused on *Pharbitis nil* a model SD plant, where we have shown that glucose is a potential floral regulator (Durdan *et al*, 2000) (Fig 1) and bulbil production in *Allium ampeloprasum* var. *babingtonii* (Fig 1.) where investigation of inflorescence development may lead to improved production of related crop plants

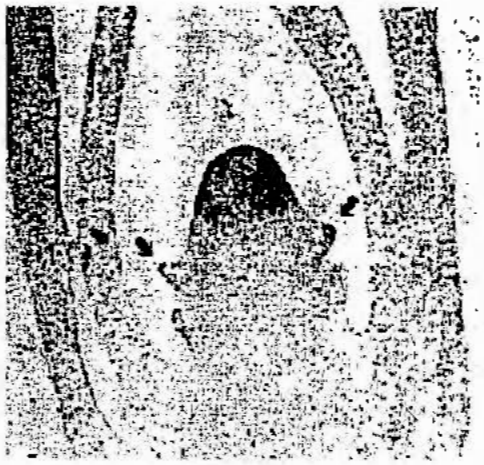


Figure 2: ***In situ*** **hybridisations to determine spatial expression of SLFY** Apices of plants were exposed to the 7LD treatment and sampled on d 35 Arrows locate tips of leaf primordia. Bar scale = 100 μm

B. Floral senescence

Floral senescence in many species is largely controlled by the plant growth regulator ethylene. However, the senescence of many economically important species is not ethylene sensitive and therefore the techniques presently available are ineffectual at prolonging their storage or vase life. In collaboration with Dr A Stead, Dr B Thomas, Dr V Buchanan-Wollaston and Dr G Griffiths I have been investigating the biochemical and molecular events occurring during floral senescence in an important UK cut flower crop: *Alstroemeria* showing ethylene independent floral senescence. We have charted the development of the flowers (Figure 3), which are normally picked at stage 1 or earlier for the European market and are fully open at stage 3; the useful vase life then extends until stage 6.

Our initial studies have focused on ultra-structure using TEM, biochemical analyses of candidate regulatory pathways and expression analysis of selected genes (Figs 4-6). We conclude that:

- Some senescence and cell death processes start extremely early and proceed throughout flower opening and senescence. This includes the gradual increase in the expression of a cysteine protease (Wagstaff *et al.*, 2002) starting from the earliest tissues examined (stage 1), the sharp decline in total LOX activity and lipid content (Leverentz *et al.*, 2002), again starting early in floral development (stage 1 and stage 2, respectively). It also supports the structural data since a reduction in nuclear size occurs from a very early stage of flower development (before Stage 1).

- However, in addition to an early start of some cell death-associated processes, another feature of petal senescence in this species is that several of these processes appear to accelerate at the time at which the first visible signs of senescence are detectable. Total protease activity (Wagstaff *et al.*, 2002), electrolyte leakage (Leverentz *et al.*, 2002) and DNA laddering all rise sharply around stages 4—5. *DAD-1* expression, used as another marker of PCD in this system, also declines 3-fold between stages 4 and 5 (Wagstaff *et al*, 2003).

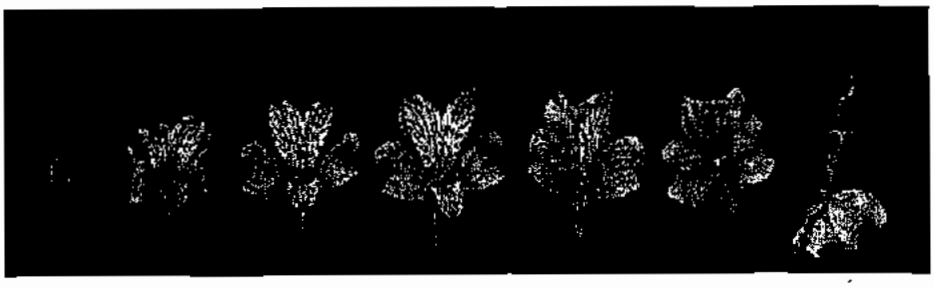


Figure 3: Stages of floral development and senescence in *Alstroemeria* (1 to 7 from L to R)

1 Coloured bud (day -1)
2 Sepals reflexed (day 0)
3 Fully open, no anthesis (day +2)
4 Fully open, anthesis (day +4)
5 In-rolling, petal discolouration (day +6)
6 Sepal translucence (day +8)
7 Corolla abscission (day +10)

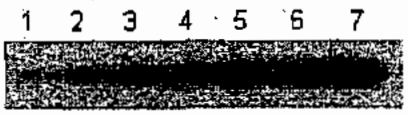


Figure 5 Semi-quantitative RT-PCR Expression analysis of ALSCYP1 a cysteine protease-like gene during *Alstroemeria* petal development and senescence (Stages 1 to 6) Autoradiograph of gene expression following 22 PCR cycles. The products were Southern blotted and a probe made from a similar reaction was hybridised to the membrane overnight.

From Wagstaff et al (2002)

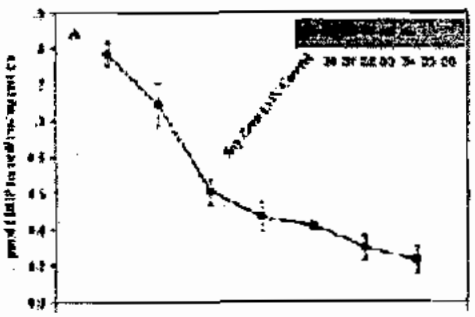


Figure 6 Total lox activity in petal tissue throughout senescence. Lox activity was determined in 13,000-g supernatants by following conjugated diene formation at 234 nm, using 18:2 as a substrate. Data points represent *n* _ 9 _ SD. The insert shows a western blot probed with antibodies raised against a recombinant cucumber (*Cucumis sativus*) lipid body lox.

From Leverentz et al (2002)

From Wagstaff et al (2001)

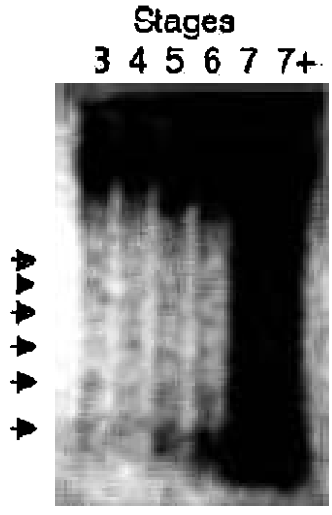


Figure 4 Genomic DNA extracted from petals undergoing senescence: showing evident DNA laddering starting early in floral development: Southern blot of DNA from *Alstroemeria* petals spanning the stages of development and senescence (Stage 7 + indicates petals which had just abscised The laddering signal was enhanced by hybridization with a probe made from genomic DNA digested with the *Sau*3A restriction enzyme. Arrows indicate the DNA ladder.

From Wagstaff et al (2003)

More recently we have made microarrays from subtracted and unsubtracted *Alstroemeria* petal cDNA libraries to look at global gene expression during petal development and senscence and also as a result of storage regimes (Fig 7).

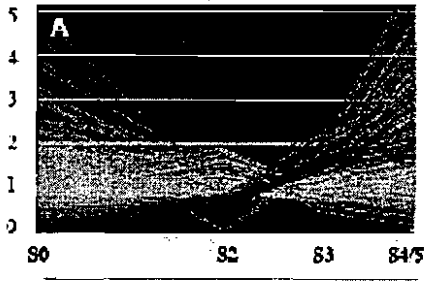


Figure 7: Microarray analysis of *Alstroemeria* petal gene expression. Expression data for 500 EST clones (for genes appearing more than once in the EST collection, a representative cDNA was selected at random from each contig).

Graphs to show the relative changes in expression of each gene in the different stages of petal senescence. Imagene data files were analysed using GeneSpring version 5.1 (Silicon Genetics). Background values were subtracted from each spot value and then the data was normalised in the following order; measurements less than 0.0 were set to 0.0, whole chip data was normalised to the 50th percentile and data for each gene was normalised to the median. The data shown is the averaged values for eight array hybridisations with each array carrying 3 copies of each gene.

From Breeze et al (Plant Biotechnology, In press)

The interface between cell division and cell death: using tobacco cell cultures to investigate cell death processes

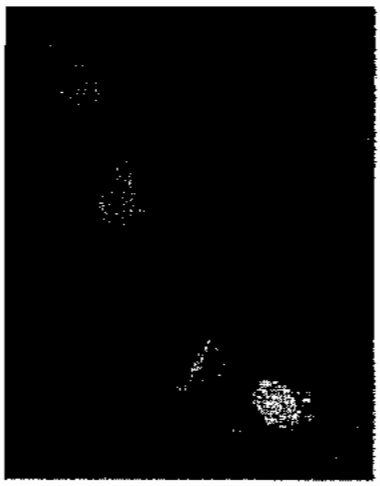


Figure 8: Tobacco TBY-2 cells stained by the Apoptag TUNEL assay. Red cells living, green cell exhibiting DNA fragmentation (apoptotic symptom)

Programmed cell death is an important process in plant development and plant-pathogen interactions. Ethylene is known to induce cell death for example in the production of aerenchyma. In yeast and animal systems, important links between cell-cycle progression and cell death are being found. Dr Dennis Francis, Dr RJ Herbert and I have used a tobacco cell culture (TBY-2 cells) to test the hypothesis that ethylene-induced cell death in this system is linked to the phase of the cell cycle. Using aphidicolin to synchronise cell division in the culture, we have shown that mortality indices are highest when cells are at the G2/M transition (Herbert et al, 2001). There is also a further, but less pronounced peak of mortality during S phase. The peak of cell mortality at G2/M is essentially abolished by the addition of silver, and is accompanied by a substantial increase in DNA fragmentation (measured by the TUNEL apoptag assay, Figure 8) and pronounced nuclear shrinkage. We are now using other inducers of PCD in TBY-2 cells to investigate the common pathways leading to cell death.

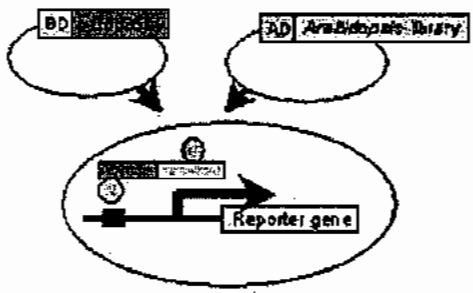


Fig 9: Using the yeast cell cycle gene, *cdc25*, as a bait to identify regulatory cell cycle genes using 2-Hybrid technology

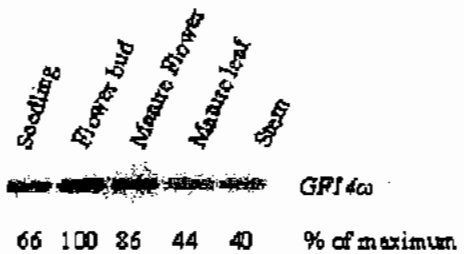


Fig 10: RT-PCR expression analysis of *GF14ω*. Highest expression is in seedlings, buds and mature flowers

From Sorrell et al (Planta in press)

Cell cycle regulation, using the tobacco BY-2 cells and Arabidopsis

Many of the genes controlling the cell cycle in plants have been isolated, however, cdc25 which is an important phosphatase regulating the transition from G2 to M phase has not. We have previously shown that the fission yeast cell cycle gene cdc25 introduced into tobacco has the effect of increasing the frequency of lateral root primordia compared to the wild type. To understand how the yeast transgene is interfacing with the plant cell cycle machinery, we have used the yeast cell cycle gene, cdc25, as a bait to identify regulatory cell cycle genes using 2-Hybrid technology (Fig 9). Using this technique we have identified three 14-3-3 proteins, one of which (*GF14ω*) could rescue the DNA damage and DNA replication checkpoints in yeast (Sorrell et al, Planta in press). RT-PCR shows that expression of this gene is elevated in rapidly dividing tissues (Fig 10). Recently we have also cloned a cell-cycle regulator from *Arabidopsis*: WEE1 (Sorrell et al, 2002) and part of our current work is directed at over-expressing this gene in *Arabidopsis* and the tobacco TBY-2 cell line.

Collaborative projects using molecular markers to study plant and fungal populations in relation to environmental and ecological parameters

I am currently using molecular markers to study the population structure and evolution of *Senecio cambrensis*. (Fig 11) in collaboration with the National Botanic Garden of Wales and Dr Richard Abbott at the University of St. Andrews. *Senecio cambrensis*, the Welsh ragwort, is a new species that originated in north Wales. It is an allohexaploid (2n=60), which arose from a cross between the native Groundsel, *S. vulgaris* (2n=40), and the introduced Oxford ragwort, *S. squalidus* L. (2n=20), between 1910 and 1930. We are using AFLPs to study the current populations of *S. cambrensis* in Wales. Our aims are to discover whether there are multiple origins of this species in Wales, the degree of genetic distinctiveness of Welsh *S. cambrensis* populations and the extent to which the extant populations are crossing with the parental populations.

Figure 11: *Senecio cambrensis*

Figure 12: species-rich old hay meadow representing an unimproved grassland site used for studying fungal diversity

We have been studying fungal community structure and diversity in two types of agricultural grassland soil by amplified 18S ribosomal DNA restriction analysis (ARDRA) and 18S ribosomal DNA sequence analysis. The two grassland sites (Fig 12) represent a species-rich old hay meadow, which forms part of a U.K. site of special scientific interest, and an agriculturally improved site with low floristic diversity. We detected differences in diversity between the two fungal communities and changes in patterns of dominance that appeared to reflect increased floristic diversity. The results also suggest that 18S rDNA based approaches are sensitive enough to be used for fungal community analysis and that they represent a less biased picture of the community than plate culturing.

In a new project we are also using molecular approaches including microarrays to study gene expression during inter-species fungal interactions (Fig 13).

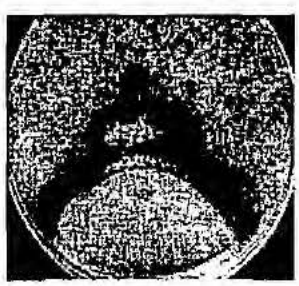


Figure 13: Pigment production by *Stereum hirsutum* (top) during interaction with another basidiomycete in agar culture.

Transgene flow from GM plants to soil bacteria

gfp and *nptII* -> *nptII* only

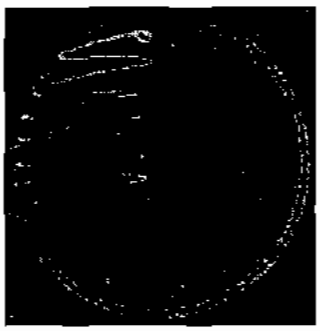


Fig 14: GFP/nptII construct in *E. coli* expressing GFP protein for monitoring gene flow from GM plants to bacteria.

We have made constructs using two marker genes: green fluorescent protein (GFP) (Fig 14) and the Kanamycin resistance gene *nptII*, to study the extent to which horizontal gene transfer by natural transformation can occur from transgenic plants to soil bacteria. We have shown that if bacterial sequences flank the marker genes we are able to achieve frequencies of 3.2×10^{-7} using transgenic plant DNA to transform the soil bacterium *Acinetobacter*. We are now investigating the parameters affecting transfer frequency in laboratory and microcosm experiments.

Selected Recent Publications

Plant reproduction and floral senescence

C. Wagstaff, U. Chanasut, F. J.M. Harren, L-J Laarhoven, B Thomas, **H. J. Rogers** and A. D. Stead. Ethylene and flower longevity in Alstroemeria: relationship between tepal senescence, abscission and ethylene biosynthesis. (Journal of Experimental Botany in press)

E Breeze, C Wagstaff, E Harrison, **HJ Rogers**, A Stead, B Thomas and V Buchanan-Wollaston (2004). Gene expression patterns to define stages of post harvest senescence in *Alstroemeria* petals. Plant Biotechnology Journal 2: 155–168.

C Wagstaff, P Malcolm, A Rafiq, M Leverentz, G Griffiths, B Thomas, A Stead, and **HJ Rogers** (2003) Programmed Cell Death (PCD) processes begin extremely early in *Alstroemeria* petal senescence. New Phytologist 160:49-59

M K Leverentz, C Wagstaff, **H J Rogers**, A D Stead, U Chanasut, H Silkowski, B Thomas, H Weichert, I Feussner and G Griffiths (2002) Characterization of a novel lipoxygenase-independent senescence mechanism in *Alstroemeria peruviana* floral tissue. Plant Physiology 130: 273-283

C Wagstaff, M K. Leverentz, G Griffiths, B Thomas, U Chanasut, A D. Stead and **H J. Rogers**. (2002) Protein degradation during senescence of *Alstroemeria* petals. Journal of Experimental Botany 53: 233-240.

H.J. Rogers, N. Bate, J. Combe, J. Sullivan, J. Sweetman, C. Swan, D.M. Lonsdale and D. Twell (2001) Functional analysis of cis-regulatory elements within the promoter of the tobacco late pollen gene g10. Plant Molecular Biology 45: (5) 577-585.

H J Rogers, S L Maund, and L H Johnson (2001) A b -galactosidase-like gene is expressed during tobacco pollen development. J Exp Bot Bot 52: (354) 67-75.

C. Wagstaff, **H.J. Rogers**, M. K. Leverentz, G. Griffiths, B. Thomas, U. Chanasut A.D. Stead (2001) Characterisation of *Alstroemeria* flower vase life. Acta Horticulturae 543: 161-175

S F Durdan, R J Herbert, **H J Rogers**, D Francis (2000) The determination time of the carpel whorl is differentially sensitive to carbohydrate supply in Pharbitis nil. Plant Physiology 123, 189-200

Cell death and cell division

D Chrimes, **H.J. Rogers** , D Francis HD Jones & C Ainsworth Expression of fission yeast *cdc25* driven by the wheat ADP- glucose pyrophosphorylase large subunit promoter perturbs both pollen and ovule development in transgenic wheat. (New Phytologist in press)

D.A. Sorrell, D. Chrimes , J.R. Dickinson, **H.J. Rogers** & D. Francis. The *Arabidopsis CDC25* induces a short cell length when over expressed in fission yeast: evidence for cell cycle function (New Phytologist in press)

P. Suchomelova, D. Velgova, T. Masek, D. Francis, **HJ. Rogers**, H. Lipavska (2004). The fission yeast cell cycle regulator, cdc25, induces de novo shoot formation in tobacco: evidence of a cytokinin-like effect. Plant Physiology and Biochemistry 42: 49-55.

D A. Sorrel, A M. Marchbank, D A. Chrimes, J. R Dickinson, **H J. Rogers** D Francis, C S. Grierson, N G. Halford (2004). The *Arabidopsis* 14-3-3 protein, GF14w , binds to the *Schizosaccharomyces pombe* Cdc25 phosphatase and rescues the DNA replication checkpoint in the *rad* ⁻ *24* mutant. Planta 218:50-57.

G Dambrauskas, S J. Aves, J A. Bryant, D Francis and **H J. Rogers**. Journal of Experimental Botany (2003) Genes encoding two essential DNA replication activation proteins, Cdc6 and Mcm3, exhibit very different patterns of expression in the tobacco BY2 cell cycle54: 699-706

DA Sorrell, A Marchbank, K McMahon, JR Dickinson, **HJ Rogers**, D Francis. *(2002)* A *WEE1* homologue from *Arabidopsis thaliana. Planta 215: 518-522*

RJ Herbert, K Stevens, **HJ Rogers**, MS Davies and D Francis (2001) Ethylene induces cell death at particular phases of the cell cycle in the tobacco, TBY-2 cell line. Journal of Experimental Botany 52: 1615-1623

Plant and fungal population biology

J Hunt, L Boddy, P F. Randerson, **H J. Rogers** (2003) An Evaluation of 18S rDNA Approaches for the Study of Fungal Diversity in Grassland Soils. Microbial Ecology 47 : 385-395.

K.V. Pryor, J.E. Young, F.J. Rumsey, K.J. Edwards, M.W. Bruford and **H.J. Rogers** (2001) Extreme diversity, genetic structure and evidence of outcrossing in the rock fern Adiantum capillus-veneris in the UK and Ireland using microsatellites. Molecular Ecology 10: 1881-1894.

Reviews

The cytoskeletal interface with cell cycle control. (2001) S. M. Wick and **H. J. Rogers** in The Plant Cell Cycle and its Interfaces (D. Francis Ed.)

Cytoskeletal regulation of the plane of cell division: an essential component of plant development and reproduction . **H. J. Rogers**. (Advances in Botanical Research, in press)

Grants

Work on floral senescence is funded by **DEFRA** and **BBSRC**, cell cycle work is funded by **BBSRC, Nuffield** and the **Leverhulme Trust**. Plant and Fungal population biology work is funded by **NERC**, the **Leverhulme Trust** and the **Gwent Wildlife Trust**.

My work is also supported by the **Cardiff School of Biosciences**, and **University College Worceste**r.

Collaborations

Work on floral senescence is in collaboration with **Dr A. Stead** (Royal Holloway) and **Dr B Thomas , Dr G Griffiths, Dr V Buchanan-Wollaston** (HRI, Wellesbourne).

Cell cycle work is in collaboration with **Dr N Halford, Dr C Grierson** (University of Bristol), **Dr D Francis** and **Dr D Dickinson** (BIOSI, Cardiff)

Population studies are in collaboration with: **Prof Lynne Boddy, Dr P Randerson** (BIOSI, Cardiff) (fungal molecular markers), **Dr Stuart Davies** (BIOSI, Cardiff), **Dr Richard Abbott** (University of St Andrews)

Transgene-flow work is in collaboration with **Dr Martin Day** and **Prof John Fry** (BIOSI, Cardiff)

Staff associated with research:

Dr Helen Ireland (post-doc on plant population biology)

Dr Latha Joseph (post-doc on plant population biology)

Dr David Parfitt (post-doc on fungal population biology)

Dr Deborah Simpson (post-doc on gene flow)

ANEXO 4: ANTECEDENTES COMPLEMENTARIOS DE LA ACTIVIDAD DE FORMACIÓN

Proposed short visit project for Danilo **241105 HJR**

Comparison of gene expression in senescent leaves and petals of wallflowers (*Erysimum linifolium)*

Background

Petal and leaf senescence are important processes in plant development of both fundamental and applied interest. Although evolutionarily leaves and petals are closely related, they perform very different functions in the plant. However they both undergo senescence with remobilisation of nutrients, and analyses of gene expression in different plant models have revealed some shared genes which are up-regulated during senescence in both tissues. Despite these indications that the processes may share common elements, very few studies have compared directly leaf and petal gene expression during senescence in the same plant. Wallflowers were chosen as the model system for this work as this species is closely related to the major plant model Arabidopsis, but has much larger pigmented flower ands is of ornamental value. Subtractive cDNA libraries were made to enrich for genes which are up-regulated during leaf and petal senescence, and approx. 1700 clones were spotted onto microarrays. In addition approx. 100 Arabidopsis genes related to senecsnec processes were also spotted onto the arrays. The microarrays were screened with old and young petal and leaf wallflower probes to verify the subtraction and compare the expression of genes across the two tissues. 484 genes were reliably scored of which approximately 100 have been sequenced. To complete this study more detailed expression patterns of selected genes is being determined by semi-quantitative RT-PCR. Further genes are also being sequenced to enable a comparison of the functional classes of genes up-regulated in the two tissues.

Programme of work

- Semi-quantitative RT-PCR will be performed using seven stages of leaf and petal to chart in more detail the patterns of gene expression of three selected genes
- Plasmid DNA will be prepared for sequencing from a further 20 genes showing interesting patterns of expression from the array data. Sequence data will then be analysed by bioinformatics tools
- Bioinformatics will be used to obtain microarray data from the publicly available databases for Arabidopsis leaf and petal senescence of the 100 Arabidopsis clones probed with the wallflower arrays. Comparison will then be made of the Arabidopsis and wallflower expression patterns revealing species-specific differences.

Training

This project will provide an excellent training for the student in state of the art molecular techniques and bioinformatics. He will be integrated into a lively group of plant molecular biologists, and into a UK network of collaborators working in the area of plant senescence. During the project he will be given the opportunity to present his work at weekly lab meetings, and if successful his work will contribute to a publication in a leading plant science journal. While in Cardiff he will also have the opportunity to attend plenary talks to broaden his scientific knowledge through contact with the diverse research groups active within the School.