BSPP News

The Newsletter of the British Society for Plant Pathology

Number 44, Summer 2003

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EDITORIAL

Communication has become something of an obsession with me lately. If inheriting the editorship of the BSPP Newsletter provided the infection, a raging fever has been prompted by the demonic behaviour of supposedly connective computer software. Seamless integration is promised on the boxes. But infuriatingly, that should actually read - NEARLY seamless integration. This is sadistically cruel, because the user, being so close to the required product, will spend untold hours in the naive belief that perfection is just one more mouse click away! Apart from colourful language, the ultimate outcome of this false promise is inefficiency and inferior output.

A cynic might observe a growing similarity between the developments in software complexity and the study of Plant Pathology. Cast an over the BSPP membership list and it is clear that the discipline is hugely wide ranging. On one hand this is a strength, because it offers greater scope to respond to new and existing challenges. However, it also poses the problem of communication and integration. Do we understand and respect the work of other plant pathologists? Or is it every group for themselves? - all too tempting, given the imperative of securing a share of the limited funding pot.

Professor John Lucas, our current president, is keen to promote the importance and relevance of Plant Pathology for developing crop protection solutions at national and global scales. Central to this aim is the need to exploit the full potential that our wide breadth of expertise can offer. The energy and enthusiasm that James Brown, gave to developing the BSPP Newsletter has provided route to maintain and improve links across the Plant Pathology community. I will aim to build upon that foundation. To this end I will encourage all newsletter contributors to consider the varied readership - by concentrating attention on context, objectives and key messages you will speak to them all.

Finally, I would remind you all that unbounded happiness and joy can be brought to North Yorkshire by the arrival of an interesting and unsolicited article relevant to Plant Pathology!

Steve Parker
bsppnews@bspp.org.uk

John Lucas - BSPP President, 2003

From dilettante to devotee

At various points in his life this year s President, John Lucas, aspired to be an artist, naturalist and journalist. So how did he eventually end up as a scientist and the current Head of the Plant-Pathogen Interactions Division at Rothamsted Research? The answer is the usual cocktail of part accident, part design.

At primary school John s first love was painting and writing stories. His exercise books consisted mainly of drawings, irrespective of the subject. Later he considered taking art as a main subject, but was also drawn to biology. John s enthusiasm for natural history began with a childhood interest in animals. At various times his home menagerie included mice, snakes, lizards, frogs, fish and even a wild crow. His parents had given him a microscope and he became fascinated by the strange shapes of diatoms and other microbial denizens of ponds. Later, in the sixth form at Surbiton Grammar School, he discovered the appeal of higher plants and ecological studies in the field. The most rewarding part of the Botany course was doing real experiments! So he chose Botany as his honours subject at the University of Exeter. The course included fieldwork on Dartmoor, expeditions along the Devon coast, and forays to collect fungi in local woodlands. It was here that he first appreciated the complex relationships of

fungi with plants. The mycology and plant pathology at Exeter were at that time taught by S.A.J.Tarr, who had wide experience of tropical diseases and hence provided a worldwide perspective. By now John had also developed an interest in cell biology and biochemistry, so following graduation it was a natural step for him to enrol for a PhD in the area of physiological plant pathology, supervised by Dennis Pitt. Exeter was a lively environment for research in plant pathology with a population of graduate students, including another current officer of the BSPP, our secretary Avice Hall. John became something of a techniques freak during his project on pink rot disease of potatoes caused by Phytophthora erythroseptica. A lot of this was down to Dennis, who not only had an encyclopaedic knowledge of microscopy and histochemistry, but also knew how to isolate, purify and assay enzymes, and was adapting medical techniques such as electrophoresis and immunoassays for use with plant and fungal proteins. He even had a complete column chromatography and fraction collection system inside a domestic refrigerator. John immersed himself in the technology, and by the time he left Exeter in 1973 was no longer afraid of either expensive equipment or designing his own experiments. He admits however that he still had a lot to learn about the single-minded pursuit of a scientific goal. Part of the problem was the subject itself. The interactions between the host and pathogen seemed too complex and interesting to be reduced to a single model. The Gene for Gene theory had been proposed more than 20 years previously but the molecular tools to dissect it were not yet available. Also, John was not yet fully committed to a research career. He applied for a variety of jobs in industry, academe and conservation both in the UK and overseas and briefly considered taking a job in scientific journalism. Eventually he was offered a position as Demonstrator in Biology at the University of Keele. At the time Keele provided a broad-based foundation year in which students covered a wide range of subjects and John found himself supervising practical classes for arts students and covering subjects as diverse as microbiology, genetics and animal physiology. To gain experience in lecturing he developed his own short course in molecular biology for non-biologists, with the aid of photos of Watson and Crick and articles from Scientific American. This was his first taste of teaching a subject far removed from the interests of the audience, and was to prove valuable later when confronted by lecture theatres full of biology students who were only doing a plant option because the course structure demanded it.

While Keele was a stimulating diversion (and greatly improved John s skills at snooker and table football), there was too little opportunity to do research and within a year he moved to Newcastle upon Tyne where he was able to concentrate more on his mycological and plant pathology interests alongside Colin Dickinson. Colin was an energetic and creative character who also had a research group which included students who went on to successful careers in plant pathology, among them Ian Crute, a former BSPP President and current Director of Rothamsted Research. At Newcastle John had the opportunity to initiate research projects on biotrophic pathogens such as the rusts and downy mildews, interests, which he has maintained to the present day. Also, with Colin, he wrote the first edition of an undergraduate textbook on plant pathology. The origin of this book was itself curious as initially they had planned to write an introductory mycology text based on their joint first year course. But the publishers Blackwell had already commissioned Jim Deacon to cover mycology, and so instead they were persuaded to write about plant pathology. Several people told John he was mad to consider it as a) he had no reputation in the subject at the time and b) career progression was based

on original papers not books. They were correct on both counts, but the book has survived to a third edition and gratifyingly is still used by lecturers and students in a number of different countries.

From Newcastle, John moved in 1976 to a lectureship in the Botany Department at the University of Nottingham where he was initially the only plant pathologist. Hence he taught the whole range of the subject, from epidemiology and disease control to the molecular basis of host-pathogen interactions. By now he had realised that even fundamental knowledge and research need to be rooted in practical problem-solving, and he recruited visiting lecturers from the agrochemical industry and extension services to introduce an applied perspective to the courses. Later Steve Rossall and Matt Dickinson joined the Faculty of Agriculture and between them they developed a number of joint courses that continue to the present, with John still acting as a special professor at the university. On the research front at Nottingham John continued to work on downy mildews, but also in conjunction with John Peberdy started to investigate the newly emerging problem of fungicide resistance in cereal pathogens, and especially eyespot disease. This research progressed well and proved productive for two main reasons. Firstly they were fortunate to recruit a series of talented graduate students and postdocs, and secondly there was sufficient interest in the area for funding to be found more or less continuously over a period of more than ten years. Their group helped to elucidate the sexual cycle in Tapesia, further characterised the genetic basis of resistance to MBC and DMI fungicides, and clarified the infection process from both conidia and ascospores. When John moved to Long Ashton in 1994, some aspects of this work went with him, again ensuring continuity. This saga provides a refreshing contrast to the short-term, on-off research culture scientists are usually faced with.

During the 1980s John twice had the opportunity to work as a visiting postdoctoral fellow at the University of Southern California, Riverside. The projects concerned systemic acquired resistance and also genetic studies on Phytophthora. This was an important experience as for the first time he was part of a graduate school specialising in plant pathology, and worked on a daily basis alongside innovative scientists such as Mike Coffey and Noel Keen. The no-nonsense competitive culture of US science also left a lasting impression.

John s later move to the Institute of Arable Crops Research was motivated in part by the same perception. Here was an organisation with a critical mass in plant pathology, and the infrastructure to take on projects requiring research teams and significant resources. He counts his time at Long Ashton as among the most rewarding of his career, but within five years the closure of the site was announced. He transferred to Rothamsted in 2000.

John is a founder member of the BSPP, and believes that the society has a bright future. The pace of change in biology and information technology poses challenges for learned societies, but there are opportunities as well as potential problems. Genomics has confirmed the importance of pathogen recognition and response systems in plant evolution, and research in this area is at the forefront of plant biology. In contrast, the crisis in agriculture has coincided with a contraction of the plant protection industry and many of the traditional areas of crop pathology activity are under review. But the proposed shift from production agriculture to an exclusively environmental agenda is a Eurocentric view, and sustaining the food chain is a global imperative. The BSPP has an international membership, and therefore can play a crucial role in both informing policy makers, and helping to solve the problems.

REPORTS FROM THE BSPP BOARD

2002 President s Report

Looking back over the year gives a better perspective on the highs and lows . Highs include the very successful meeting on Plant Pathology and Global Food Security in July. Many distinguished international speakers used this opportunity to consider the issues facing Plant Pathology in a world where c800 million people are still uncertain where their next meal is coming from. There was an excellent number and quality of entries for the P H Gregory paper reading prize and some superb posters. The future of Plant Pathology is in good hands, judged from much of work presented. The Conference Dinner, always an enjoyable occasion, was especially so this year with the presence of all but one of the past Senior Editors of Plant Pathology in celebration of its 50 years of publication. The Society was also pleased to have as its guests the current President of the Association of Applied Biologists and the immediate past President of the British Mycological Society.

Another very satisfying move, the benefits of which will, I hope, be seen in the future, was the establishment of a fund to promote Plant Pathology to a wider audience. The Board of BSPP recognised that the Society needed to promote the subject beyond our professional discipline. The current antipathy towards science is a serious concern and this fund should go a little way towards fostering and promoting a better understanding of the role, function and importance of Plant Pathology.

Possibly the most obvious interface most of our members, and other scientists, have with the BSPP is through its journals. I have already mentioned the 50 years of Plant Pathology and the Senior Editor has given more details elsewhere. Of more recent origin but now well established and respected is Molecular Plant Pathology, and the New Disease Reports are obviously fulfilling an important and valuable need. All of our publications, and the Society, owe a great amount to the Senior Editors. Please support them and your journals by making them the first choice for all the excellent papers you write. In doing so you will be achieving both esteem for your work and supporting your society. Our journals are, as is our membership, truly international.

The Society has continued to contribute to member s travel requests and an especial allocation was made to support attendance at ICPP 2003 in Christchurch, New Zealand in February 2003. Student bursaries, support for M.Sc. students and Fellowships are also available and have been taken up during the year.

Members of the Board work hard to produce publicity material and promote BSPP widely. Please help them by promoting BSPP among colleagues, and the Society by offering to help as Officers of the Society and Board members. I recognise that there is increasing pressure on all scientists to deliver on an agenda set by others, and this pressure is unlikely to diminish. However, the BSPP is vital to a successful and thriving Plant Pathology and needs your help. In recognition of the pressures on individuals steps have been taken during the year, and more are underway, to lessen the bureaucratic load on Board members and Officers.

I recognise, and apologise, for the fact that in the vital area of dealing with our membership we have not given the service that members have a right to expect. I believe that this has now been rectified but it will take a little while to achieve the quality we

desire, and I hope that the membership will bear with us. Another personal concern during the year has been the apparent risk of the fragmentation of Plant Pathology and thus the diminution of its impact. The task of promoting the subject and its importance will not be helped by describing ourselves as molecular biologists, modellers, epidemiologists etc., rather we should be identifying our discipline and then, if we wish, our speciality within it.

The Newsletter is a vehicle for your views and comments, as is the website, please use them. The Newsletter Editor and the website manager put in much effort to deliver information in an accessible and pleasing way but do depend on the membership for good material.

It has been an honour and a pleasure to serve as your President for 2002. On my behalf and on behalf of all members I thank the Officers and Board members for all the work they do, most of which is not apparent to the membership. Please support them and the BSPP in the future

Roger Plumb
BSPP President, 2002

Plant Pathology

A second meeting this year with Blackwell Publishing on 3 December allowed the annual data for *Plant Pathology* to be fully updated. Details are given in the table, which can be found at the end of this article. Most factors remain stable with the exception of price to subscribers (increasing 8% annually) and submissions (decreasing this year by 15%).

The UK price (£475) for next year (2003) is the Standard option (print and online-access to current and preceding year). A Premium option (£523) provides print and online-access to all online back volumes, full access for remote users, access to all current year s material on *Synergy* and the likelihood of access to articles published ahead of print. Price for overseas subscribers is 10% extra. Articles in *Plant Pathology* were accessed 9,755 times through *Synergy* in 2001. This year accesses have increased to 11,897 for the period up to the end of October.

The decline in submissions of full papers to the journal has to be addressed. Initiatives to encourage submission of manuscripts are reflected in the marketing plans of Blackwell Publishing - promotion at conferences (15 in 2002, 22 in 2003); e-mail promotions e.g. authors and delegates, author nominated e-mail PDF offprints, advertising in journals, on websites; promotional material in delegate packs and posters. Other aspects related to attracting submission of manuscripts require discussion including;

- thematic issues
- new directions/emphasis for the journal
- new editors in sensitive locations, e.g. Asia, the Americas
- commissioned review articles with
- no colour charges for authors
- free colour on-line for all articles
- electronic submission and editorial
- tracking of manuscripts

Production of *Plant Pathology* has continued to improve during the year. Actual publication dates, however, are always 1 3 weeks later than scheduled, despite copy being dispatched to Blackwell ahead of deadline. Modification of schedules and dispatch of final copy to typesetters should eliminate this problem. The Editorial Board remains unchanged.

Richard Shattock
Senior Editor, Plant Pathology

Molecular Plant Pathology

In 2002 we have seen a large increase in the total number of articles published in MPP. In addition to publishing more Original Articles, some Issues have more than one Pathogen Profile and we are also publishing more Review Articles. The increase in Original Articles published this year reflects the increased copy flow of good quality manuscripts. 88% of the Original Articles published are from overseas groups (*i.e.* non-UK).

Year	1997	1998	1999	2000	2001	2002	2003
Volume	46	47	48	49	50	51	52
Papers	103	97	103	92	89	85	
NDRs				11	26	42	
Overseas (%)	68	73	70	70	70	69	
Pages budgeted	1200	804	804	820	820	820	820
	+42	+30	+30	+30	+30	+30	+30
Pages Published	1003	810	846	816	822	813	
	+37	+30	+30	+30	+30	+30	
Subscribers	617	590	544	532	500	486[a]	
Members	690	776	721	570	589	570	
UK Price (£)	298	318	350	375	408	440	475
Submissions	210	217	223	199	190	161	
(excludes NDRs)							
Rejected (%)	64	56	46	50	58	54	
Months to Rejection	2.8	2.3	2.5	2.6	2.1	2.0	
Months to Acceptance	4.3	5.7	4.4	5.3	4.8	5.2	
Months to Publication	10.5	11.3	10.2	10.3	10.6	9.7	
Range		6-24	5-23	4-18	4-23	4-24	
Number of Editors	44	38	41	33	37	36	
Impact Factor	1.07	0.84	0.95	0.90	1.03		

[a] + 300 Consortium-linked online library sites

Our initial team of Senior Editors and Editorial Board were appointed for a three-year period, which came to an end in 2002. The entire Board have worked incredibly hard to help establish us as an internationally recognised journal. We would like to thank everyone on the Board for getting us where we are today. A new line up of Senior Editors and Editorial Board are in place for 2003, which will see us through until late 2005.

Senior Editors: James Alfano, Ulla Bonas, Ralph Dean, Sarah Gurr, Sophien Kamoun, Andrew Jackson, Andrew Maule, Richard Oliver, Ken Shirasu and Jan Van Kan.
Editorial Board: Caitilyn Allen *USA*, Miguel A. Aranda *Spain*, Matthieu Arlat *France*, Margaret Boulton *UK*, James Brown *UK*, Thierry Candresse *France*, Vitaly Citovsky *USA*, William O. Dawson *USA*, Antonio Di Pietro *Spain*, Bryce W. Falk *USA*, Mark L Farman *USA*, Ricardo Flores *Spain*, Clay Fuqua *USA*, Godelieve Gheysen *Belgium*, Scott E. Gold *USA*, Jon Green *UK*, Jean Greenberg *USA*, Sheng Yang He *USA*, Eric Holub *UK*, Barbara J. Howlett *Australia*, C. Cheng Kao *USA*, Dan Klessig *USA*, Karl-Heinz Kogel *Germany*, Barbara Kunkel *USA*,Steven A. Lommel *US*, John Lucas *UK*, John M. Manners *Australia*, John W Mansfield *UK*, John M. McDowell *USA*, Luis Mur *UK*, Richard S. Nelson *USA*, Thorsten Nuernberger *Germany*,Neil Olszewski *USA*, Jane Parker *Germany*, Ian T.D. Petty *USA*, Dominique Roby *France*, D Ann M. Rochon *Canada*, Pamela Ronald *USA*, Shauna Somerville *USA*, Imre E. Somssich *Germany*, Bart Thomma *Belgium*, Paul Tudzynski *Germany*, Jari Valkonen *Finland*, Yuichiro Watanabe *Japan*, Peter Waterhouse *Australia*

Molecular Plant Pathology has been accepted for abstracting by ISI, and we are very pleased to say that MPP is now Indexed/Abstracted in - Biochemistry & Biophysics Citation Index, BIOBASE (Current Awareness in Biological Sciences), Current Contents (Agriculture, Biology and Environmental Sciences), Expanded ISI Alerting Services (Biotechnology) and Science Citation Index.

Gary D. Foster
Editor-in-Chief

Programme Secretary s Report

The Presidential meeting (Professor Roger Plumb) in 2002 took place at Imperial College, London in July 2002 on the theme of Plant Pathology and Global Food Security . In addition to some excellent PH Gregory competition talks and posters (the quality and professionalism of which is getting better every year), there were important and significant contributions from an international array of speakers. Although the attendance at the meeting was lower than that at some previous Presidential meetings, the quality of the science and opportunities for discussion and debate were excellent, and the meeting was a considerable scientific success.

A date for your diaries the 2003 Presidential meeting (Professor John Lucas) will be taking place on **December 15th-18th** at the **Jubilee Campus**, the **University of Nottingham**. The theme is PLANT-PATHOGEN GENOMICS FROM SEQUENCE TO APPLICATION , and there will be sessions on: Why use genomics, the current state of the art, functional genomics, bioinformatics, emerging insights into pathogens and their interactions with plant hosts, and the applications to plant pathology. The Garrett Memorial Lecture is to be delivered by Professor Richard Michelmore, UC Davis, and a programme has been posted on the BSPP webpages. The Jubilee

Campus is a new part of the University, close to the main University Campus and to the centre of Nottingham. There are good transport links with the rest of the UK, and the local East Midlands airport is now used by a number of budget airlines.

Other meetings in which the BSPP are involved in 2003 include the Fungal genetics and molecular biology meeting (Gregynog), which this year will be held in Ambleside, on September 15th-17th, and meetings to look forward to in 2004 include the 11th International cereal rust and powdery mildew conference in Norwich in August, and the BSPP Presidential meeting (Dr Stuart Wale), which will be held in Aberdeen on 5th-10th September. The theme for this meeting will be Discovery, Development and Delivery in Plant Pathology and will be run jointly as the BSPP Presidential meeting and the 7th European Foundation for Plant Pathology (EFPP) meeting.

Finally, if there are any one-day meetings that you are planning or thinking of planning, and you are interested in some financial support and assistance from the BSPP, please contact me to discuss them (matthew.Dickinson@nottingham.ac.uk) - we re here to help!

	Title of Meeting	**Date**
2003		
July	XIth International Congress of Molecular Plant Microbe Interactions http://www.arriam.spb.ru.mpmi/, St Petersburg, Russia	**18-27 July**
August	APS 95th Annual Meeting, Charlotte, N. Carolina	**9-13 Aug**
September	Society for General Microbiology - Genomics Conference, UMIST, Manchester	**8-11 Sept**
	International symposium on greenhouse tomato integrated crop protection and organic production http://www.ctifl.fr/, Avignon France	**17-19 Sept**
December	**BSPP Presidential meeting - PLANT - PATHOGEN GENOMICS - FROM SEQUENCE TO APPLICATION,** Nottingham	**15-18 Dec**
2004		
August	11th International Cereal rust and powdery mildew conference Norwich, UK	**22 Aug**
September	**BSPP Presidential meeting / 7th EFPP meeting - Discovery, Development and Delivery in Plant Pathology,** Aberdeen	**5-10 Sept**
October	XIII International Botrytis Symposium http://www.agri.gov.il/events/BotrytisSym/BotrytisSymposium.html Antalya, Turkey	**15-31 Oct**

BSPP Publicity

2002 was a very successful year for the BSPP publicity team. After moving to new designs and commissioning two portable banners advertising the society, we had stands at a number of conferences throughout the year including:

BSPP Presidential Meeting, Imperial College, 8-10 July

Molecular biology of fungal pathogens, Gregynog, Wales 17-19 July,

Joint meeting with the Scottish Microbiology Society, Paisley, 4 September

BCPC Pests and Diseases, Brighton, 18-21 November

A list of upcoming conferences was also compiled to identify venues for future BSPP stands. We also liased with Blackwell Publishing about promotional material for the journals Plant Pathology and Molecular Plant Pathology to be used at conferences where BSPP are represented. It was arranged that Blackwell Publishers would send material to venues on request by the publicity team. A questionnaire was compiled for BSPP members to get their views on how the society was run and results will be disseminated to the membership.

Ian Toth and Jane Chard

CONFERENCE ANNOUNCEMENTS

The next International Plant Virus Epidemiology Symposium will be held on 4-8 April 2005 in Lima, Peru. This Symposium is sponsored by the Plant Virus Epidemiology Committee of the International Society for Plant Pathology, and is being organised by Pamela Anderson [email:p.anderson@cgiar.org], and her staff at the International Potato Center based at La Molina on the outskirts of Lima, the capital of Peru.

The next Meeting of the International Working Groups on Legume and Vegetable Viruses will be held in the following week of 11-15 April, 2005 at Fort Lauderdale in Florida. This joint meeting of the IWGLV and IWGVV is being organised by Gail Wisler [email:gcwisler@mail.ifas.ufl.edu] of the University of Florida, Gainsville.

It is hoped at that as many interested people as possible will be able to participate in both the Florida and Peru meetings.

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British Society for Plant Pathology

President 2003: Professor John Lucas

Presidential Meeting 2003
Jubilee Campus, University of Nottingham, UK

15th-18th December 2003

PLANT PATHOGEN GENOMICS - FROM SEQUENCE TO APPLICATION

Booking Secretary and Local Organiser: Dr Matt Dickinson
(email: matthew.dickinson@nottingham.ac.uk)

Programme updates and additional information on BSPP can be found at the Society's website at: http://bspp.org.uk

PEOPLE AND PLACES

Central Science Laboratory

Several staff from the Plant Health Group of CSL have returned recently from the British Crop Protection Council s conference on Pests & Diseases with a slight feeling of sadness. This was the last time the event would be held in Brighton, after more than 25 years the event is to move to Glasgow. Members of staff presenting work at the event this year included Giles Budge and Christine Henry with their paper Assessment of the resistance of UK winter wheat varieties to the diseases caused by *Soil-borne wheat mosaic virus* and *Wheat spindle streak mosaic virus* . Also presenting was Judith Turner with a paper co-authored with Sharon Elcock, Keith Walters and Daphne Wright entitled A review of pest and disease problems in winter oilseed rape in England & Wales . Judith and Sharon also teamed up with Nigel Hardwick and Jean Slough on Nigel s paper entitled Oilseed rape and cereal diseases how are farmers responding to their control? These latter presentations made extensive use of the data from DEFRA funded cereal disease surveys that CSL has been carrying out annually for over 30 years. The survey also provided the data for Moray Taylor s poster at the conference, which had the intentionally vague title of Why do cereal diseases occur where they do?

David Stead s bacteriology team have recently launched the National Collection of Plant Pathogenic Bacteria (NCPPB) on line under the curatorship of Andy Aspin. The web site, developed entirely in house by Plant Health Group staff Sharon Elcock and Tracey Preston, can be found at http://www.ncppb.com. Services offered by the NCPPB include the supply of around 3,500 strains currently held including nearly all type strains of plant pathogenic bacteria and an identification/characterisation service based on automated fatty acid profiling, nutritional profiling and genetic fingerprinting.

David Jones of the Plant Health Consultancy team attended the ACORBAT banana industry meeting in Catagena de Indias in Colombia from 28 October 1 November 2002. As keynote speaker, David addressed the delegates on the subject of exotic diseases that posed a threat to banana production in the Latin American/Caribbean region and precautions that needed to be taken to prevent their introduction. David said that the entertainment offered in the evenings was amongst the best that he had ever experienced at a scientific/trade conference with a dinner dance in a Spanish colonial castle and a fashion show at a beach resort that featured glamorous models!

The European network for development of an integrated control strategy of potato late blight held its seventh workshop since 1996 at the Plant Breeding and Acclimatization Institute in Poznan, Poland, from 2 6 October. Nigel Hardwick and Moray Taylor from the Crop Disease Research team attended along with over 45 other late blight researchers from 16 countries. Moray presented a paper Spatially interpolated Smith Periods and blight outbreak dates in the UK, 1998 2002 co-authored with Nigel and Nick Bradshaw of ADAS. Although the entertainment provided cannot quite match what David Jones describes above, there was a visit to the home of the Polish travel writer Arkady Fielder containing a fascinating collection of artefacts picked up on his

many travels around the World.

Valerie Harju of the Virus Biology and Risk Assessment team reports that they are co-ordinating an EU project called DIAGPRO. In partnership with diagnostic laboratories in The Netherlands, Spain and Scotland, 15 protocols containing the best available methods for detection and diagnosis of a wide range of plant viruses, viroids, fungi, bacteria and insects have been researched and written. Specialists in diagnostic laboratories throughout Europe have ring-tested and validated the protocols. Fifty plant pathologists and entomologists from 19 countries attended the final meeting at CSL in October to discuss the results of the project. The details and protocols, which will continue to be updated until March 2003, are available at http://www.csl.gov.uk/prodserv/diagpro

The Plant Health Group has seen some restructuring in recent months in relation to the Genetically Modified Organisms Inspectorate. The inspectorate comprises an inspection and enforcement section lead by Alison Wright housed within a research and development Team led by Christine Henry. Forensic research within the Team will be delivered by research staff, including new appointees, to provide support for the Inspectorate. The work of the new GM Enforcement team was presented to all staff at a lunchtime seminar in late November with the snappy title The CSL GM Inspectorate: To boldly go

Moray Taylor

STUDENT REPORTS

The role of DNA methylation in the development of *Puccinia recondita*

Cereal rusts are caused by biotrophic fungi, which are able to reduce foliage, root growth and yield. The fungi decrease the translocation of photosynthates away from the infected tissues, and redirect materials to the infected tissues. This causes reductions in both the quantity and the quality of the grain produced. Each year, cereal rusts are responsible for great losses in grain yields. In the past, these diseases have had devastating consequences, causing famines and harming the economies of many countries.

Brown rust of wheat is caused by the biotrophic rust fungus, *Puccinia recondita*. The fungus is a basidiomycete, and goes through different stages in its life cycle. The asexual stage of the fungus is the urediospore, which germinates on wheat plants, and is able to reproduce asexually to produce more urediospores. The urediospore lands on the plant and receives a stimulus, which causes it to germinate. A germ tube then grows along the surface of the plant, enters the plant through a natural opening, and forms a structure called a haustorium. During this development from a urediospore to a germ tube to a haustorium, the fungus goes through different stages which each require the expression of different genes. Little is known about the processes by which *Puccinia recondita* controls gene expression during its development.

Gene silencing by DNA methylation is a known method of gene control in animals, plants and fungi. Methylation occurs by the transfer of a methyl group to carbon 5 of cytosine residues. DNA methylation is essential in the development of animals and

plants. Mouse mutants, defective in DNA methylation, are embryonic lethal, and in *Arabidopsis*, reduced DNA methylation causes phenotypic abnormalities.

The aim of my project was to investigate the role of DNA methylation during the development of the fungus *Puccinia recondita*, from a urediospore to a germ tube to a haustorium. In order to do this, a modified AFLP (amplified fragment length polymorphism) technique was used. Extracted DNA (from urediospores, germ tubes and haustoria) was restricted with EcoRI and a methylation-sensitive restriction enzyme, HpaII, which only restricts unmethylated DNA. Using selective primers, subsets of the DNA fragments were amplified, using PCR, and the fragments were separated by size, using agarose gel electrophoresis. This allowed observation of the differential methylation states of the DNA from the three stages of development.

In the experiments, the majority of DNA fragments were the same size in all three stages of development. However, there were clear differences in fragment size between the three growth stages, indicating differences in the methylation states of their DNA. Therefore, these results demonstrated that there are differences in DNA methylation patterns between the three growth stages of the fungus. This suggests that DNA methylation controls the expression of different genes at the different developmental stages of the plant-pathogenic fungus, *Puccinia recondita*.

During my nine-week project, I have learnt many new skills, including AFLP technique, PCR methods and agarose gel electrophoresis. I have enjoyed my time in the Microbiology lab at the University of Nottingham, and I am continuing the research as part of my degree. I would like to thank BSPP for the funding provided for this research.

Karen Parker

Detection and differentiation of *Rhizoctonia* spp. causing rice sheath diseases in Bangladesh using molecular techniques

As part of my MSc course in Plant Disease (Pest Management) at Imperial College I carried out a 4 month research project at Horticultural Research International (HRI), Wellesbourne. My project formed part of ongoing work (DFID-CPP project R7778 on rice sheath disease complex) at HRI investigating the use of PCR to detect and distinguish *Rhizoctonia* species causing rice sheath diseases. In addition I was involved in work being done to assess the genetic variation of *Rhizoctonia solani* K hn (causal agent of rice sheath blight) isolates from Bangladesh using amplified fragment length polymorphism (AFLP) markers.

Rice (*Oryzae sativae* L.) is the staple food in Bangladesh and rice cultivation plays an important social and economic role in the country. One of the primary constraints to rice production in Bangladesh and throughout the world has been the emergence of sheath diseases, in particular sheath blight, during the last 30 years. This has been attributed to the widespread adoption of susceptible, higher yielding modern varieties.

Control of rice sheath blight has been hampered by the failure to accurately distinguish sheath blight from other sheath diseases.

Aggregate sheath spot (*R. oryzae sativae* (Sawada) Mordue) and sheath spot (*R. oryzae* Ryker & Gooch) are two other sheath diseases of rice causing symptoms very similar to those of sheath blight. In addition, lack of knowledge of the population structure of *R. solani* has impeded effective disease control.

During the project, utility of PCR as a diagnostic tool to detect and distinguish the three *Rhizoctonia* species responsible for rice sheath diseases by using species-specific primers was investigated. At HRI, species-specific primers for *R. solani*, *R. oryzae sativae* and *R. oryzae* had already been developed based on their different DNA sequences from the ribosomal RNA gene block.

Field officers of the BRRI (Bangladesh rice research institute) collected 122 samples of diseased rice sheath samples, from two disease hot spots in Bangladesh. DNA was extracted from these samples using a rapid and simple protocol and tested with species-specific primers for the presence of each of the three *Rhizoctonia* species.

Results from these tests showed that disease/pathogen diagnosis based on symptoms was not always a reliable indication of the causal agent of disease. For instance, of the 41 samples that were identified as sheath spot based on symptoms, the pathogen *R. oryzae* could only be detected in two samples by PCR based diagnosis. *R. solani* was detected most frequently (approx. 77 % of all samples), followed *by R. oryzae sativae* (approx. 39%). In almost 30% of diseased rice sheath samples more than one *Rhizoctonia* spp. was detected, PCR diagnostic tests are, therefore, useful to distinguish the three species. Moreover, diagnosis by this method is fast, requires low amounts of template DNA and can detect pathogens in the absence of symptoms. The experiment also shows that DNA extracted using inexpensive and rapid techniques is suitable for this sort of PCR diagnosis and can therefore be adopted in countries like Bangladesh.

In the second part of the project the genetic variability of *R. solani* in Bangladesh was studied using AFLP markers. It is important to determine the extent of variability in the pathogen population so that durable control measures can be developed. Forty six *R. solani* isolates were collected from rice across Bangladesh by BRRI field officers and characterised by AFLP analysis, which is relatively fast, inexpensive and reproducible.

The isolates were first cultured in liquid media, harvested and freeze-dried. DNA was then extracted and quantified. The genomic DNA was restricted with *Eco* RI and *Mse* I endonucleases after which adapters were ligated to the restricted ends. Restricted fragments were pre-amplified and then selectively amplified using *Eco* RI primer with 2 selective nucleotides and *Mse* I primer with 3 selective nucleotides. Six selective primer combinations were used. Products of selective amplification were electrophoresed on gels, stained and visualised under ultra violet light.

The AFLP fingerprints showed high levels of variation amongst *R. solani* isolates and there was no geographic clustering. Dendograms depicting genetic relationships

were generated using DNA profile matching software (Phoretix/BioGene). Isolates of *R. solani* could broadly be separated into two large groups, those that generally clustered together with over 50% similarity, and those that fell outside of this cluster.

The high level of genetic variability reflects the morphological variation associated with *R. solani* and could be due to a high frequency of asexual genetic exchange or a higher incidence of sexual reproduction in the field than previously assumed. The high degree of pathogen diversity suggests that developing control strategies against rice sheath blight is likely to be a difficult task.

During the project I was able to learn about some of the modern and innovative molecular techniques that are increasingly being used in plant pathology. The project was rewarding for me in the sense that the results obtained will contribute somewhat to a better understanding of rice sheath diseases in Bangladesh and hopefully to disease control strategies being developed at HRI.

I live in Africa where crop diseases are a major hindrance to food production. In future it is anticipated that modern molecular techniques will contribute to crop disease control and greater food security in Africa as in other parts of the world. In this regard I feel privileged to have received the training and exposure in molecular plant pathology techniques during my project.

I would sincerely like to thank the BSPP for awarding me a Masters research bursary for the duration of the project. In addition I am grateful to HRI and Dr. Sreenivasaprasad for the warm welcome and opportunity to join and contribute to one of their ongoing projects. In addition I would like to thank my supervisors Dr. S. Muthumeenakshi and Dr. S. Archer for their invaluable assistance and advice throughout the project.

Biswanath Das, Imperial College, University of London.

Yellow Rust of Wheat: What is Non-Host Resistance?

Yellow rust is a foliar disease of cereals caused by the biotrophic fungus *Puccinia striiformis*. The host range of this pathogen is very restricted, with specific *formae speciales* of the pathogen infecting wheat (*P.s.* f.sp. *tritici*) and barley (*P.s.* f.sp. *hordei*). Most isolates of *P.s.* f.sp. *hordei* are unable to infect most genotypes of wheat.

Previous work at the John Innes Centre had identified genes for non-host resistance in the wheat *cv*. Lemhi to a barley-attacking isolate of yellow rust *(P.s.* f.sp. *hordei*). A cross between *cv*. Lemhi and *cv*. Chinese 166 (susceptible to *P. s.* f. sp. *hordei*) had identified two independent dominant genes (*Psh1* and *Psh2*), plus gene/s of small effect, some possibly coming from Chinese 166. This previous study formed the basis of a program to examine the genetics of non-host resistance in wheat to *P.s.* f.sp. *hordei.*

The aim of the project, and my study in particular, was to locate *Psh1* and *Psh2* on the wheat genome using chromosome specific simple sequence repeats (SSR) markers, to add these markers to a previously developed AFLP map, and to map both the major genes and identify any minor genes contributing to the non-host resistant phenotype.

Studying resistance genes (as well as other agronomically important genes or QTLs - quantitative trait loci) requires the development of genetic maps of informative mark-

ers. Microsatellites or SSRs, with tandem repeats of 2-3 bps, have emerged as an important source of genetic markers in wheat, because they are very informative (ubiquitous in the genome, chromosome-specific and highly polymorphic).

Both SSR and AFLP maps where developed for an F_2 population of 118 individuals derived from the cross Lemhi x Chinese166. All individuals were previously screened for resistance/ susceptibility to the pathogen, being given a phenotypic score according to the severity of disease infection.

SSR markers covering the entire wheat genome were screened for polymorphism between Lemhi and Chinese166 and those showing polymorphism were screened in the population. Forty-two SSR markers and 172 AFLP markers were used in the mapping analysis.

Using the map construction software, JoinMap version 3.0 for Windows, 22 linkage groups were constructed, onto which the disease infection scores were regressed using the QTL mapping software, MapQTL, version 4.0 for Windows. This software establishes a relation between phenotypic and genotypic data in order to predict the position of any genes influencing the trait in question.

Two QTLs, having a large effect on phenotypic variation (*Psh1* and *Psh2*), and originating from the resistant parent Lemhi, were detected and consistently associated with the same markers using both parametric (interval mapping) and non-parametric (Kruskal-Wallis) tests. In order to detect possible QTLs of minor effect, sometimes masked by the strong effect of major QTLs, a multiple QTL-model (MQM mapping) was applied. In this model, markers close to QTLs detected in interval mapping are selected as cofactors to take over the role of the nearby QTLs. If a QTL explains a large proportion of the total variance (as is the case for *Psh1* and *Psh2*), the use of a linked marker as cofactor importantly enhances the power of the search for other segregating QTLs. After automated selection of the appropriate cofactors, MQM analysis allowed the detection of two other possible QTLs, with minor effect, one originating from *cv*. Chinese 166 and the other from *cv*. Lemhi.

The results obtained in this study reinforce the conclusions from Johnson and Lovell (1994). The presence of two major and two minor QTLs explains the phenotypic proportion in the F_2 population of 115 resistant to 3 susceptible, and the presence of one gene of minor effect associated with *cv*. Chinese 166 is consistent with the fact that this cultivar is not 100% susceptible.

As a Masters student coming from a small university in Portugal, my BSPP bursary gave me the opportunity to finish my studies promptly, and most of all to develop my skills and widen my horizons. Thank you for this opportunity, to work in one of the most prestigious Plant Pathology research centres in the world, with a group of hard working and helpful people with solid objectives.

Paula Rodrigues, Tras-os-Montes e Alto Dourne, Vila Real, Portugal

Conference Announcement

Third European Symposium in Aerobiology
Worcester, UK
August 30 to September 4, 2003
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Paula Rodrigues

Downy Mildew

The downy mildews are obligate biotrophic pathogens, responsible for disease on many economically important crops including maize, rice and leguminous species. Downy mildews specific to wild hosts have been implicated in disease of closely related cultivated hosts such as downy mildew on wild and cultivated tobacco species. The downy mildew species *Peronospora sordida* and *Peronospora grisea* are pathogenic on *Scrophularia nodosa* (figwort) and *Veronica* species, respectively. *Peronospora grisea* is also responsible for disease on cultivated *Hebe* species and may cause considerable damage to young stock in nurseries. *Hebe* species are related to *Veronica* species with an estimated divergence date of 10 million years ago. Reports of the disease on *Veronica* species predate those on *Hebe,* and though *Hebe* species originate in New Zealand it appears that the disease was first reported in cultivated varieties in Europe.

Peronospora hariotii, a pathogen of *Buddleja davidii,* was originally described as *Peronospora sordida* due to the morphological similarity between the two species. The disease was first reported just under 100 years ago and has been recorded in the UK for only 20 years, almost exclusively on nursery stock. Its recent emergence suggests that it may have originated from a closely related wild host rather than as an introduction with *Buddleja davidii* from China.

The purpose of this study was to see if downy mildew infection of *B. davidii* paralleled the situation in *Hebe* species where infection was believed to originate from a closely related wild species. *Peronospora sordida* had previously been implicated as the causal agent of the disease on *B. davidii* and preliminary molecular analyses suggested the two downy mildews were closely related. Therefore morphological characterisation, cross-inoculation studies and molecular analyses were used to determine the relationships between many isolates of *P. hariotii* on *B. davidii, P. sordida* on *S. nodosa* and *P. grisea* on *V. beccabunga* and *Hebe* species.

The morphological studies and pathology

were completed at the University of Wales, Bangor and the molecular analysis at the Scottish Crops Research Institute (SCRI) in Dundee. Morphological comparisons were relatively straightforward but maintaining sparsely sporulating leaf material (especially *B. davidii*) proved challenging. With the exception of a few cases cross-inoculation proved impossible.

Molecular analysis, via PCR and sequencing of the regions encoding the internal transcribed spacers of ribosomal DNA proved successful. Many downy mildew species collected from both wild and cultivated plants were included in this part of the study. Sequence analysis confirmed that isolates described as *P. hariotii* and *P. sordida* are very closely related and perhaps the same species. However some intraspecific diversity was observed within *P. hariotii*. *Peronospora grisea* isolates from *Veronica* and *Hebe* species had virtually identical ITS sequences but were unrelated to *P. sordida* and *P. hariotii.*

As downy mildews are obligate biotrophs their evolution may parallel that of their host species. The hosts of the three downy mildew are all members of the Scrophulariaceae family and it would appear that the phylogeny of the host and pathogen have some similarities. *Veronica* and *Hebe,* both infected by *P. grisea* are from a different Scrophulariaceae lineage than the figworts (*Scrophularia*). Despite taxonomic uncertainty over *Buddleja,* recent studies on chloroplast gene sequences and chemical composition have suggested it is closely related to *Scrophularia* species. Both species are infected by the closely related, or conspecific, downy mildews *P. sordida* and *P. hariotii.*

Analysis of other downy mildew species showed that *P. viciae* on both wild common vetch and cultivated faba beans were closely related as was *P. viciae* to *P. manshurica* a pathogen of soybean again hinting at co-evolution. Conversely, distantly related hosts such as nettles and poppies are infected by closely related downy mildew species *P. debaryi* and *P. cristata.*

This study enabled me to get to grips with a range of different techniques and has hopefully contributed something to the downy mildew research being carried out both in Scotland and Bangor. I would like to thank Dr Richard Shattock, Dr David Cooke, Naomi Williams and the *Phytophthora* lab in Bangor for all their assistance throughout this project as well as the BSPP for funding the molecular work.

Alice Smith

T-DNA tagging in the mycopathogen *Verticillium fungicola.*

In the UK, the horticultural production of *Agaricus bisporus*, the white button mushroom is valued at £165 million per annum. The crop is prone attack from a range of pests and diseases. Commercially, however, the largest damage is caused by the fungus *Verticillium fungicola* var. *fungicola,* which causes dry bubble disease and stipe blowout. The pathogen is a necrotroph, and penetrates the *A. bisporus* hyphae via a combination of mechanical pressure and enzymatic degradation of the host cell walls. The main symptom of late-stage infection is the appearance of brown necrotic regions on the mushroom cap. Until recently, due to the complex nature of the fungus - fungus interaction, little more was known about the process of *V. fungicola* infection of *A. bisporus*.

Sources of infection on commercial mushroom farms include peat and limestone that are used in the cultivation process, hands of employees, and insects. Two distinct approaches to control of *V. fungicola* are employed. The first is based on traditional strict hygiene, disinfection and environmental control. But hygiene alone cannot control disease in late flushes. The second is the application of approved fungicides. How-

ever, safety and resistance concerns about prochloraz manganese, the only fungicide available for control, have resulted in plans to phase out its use. Unfortunately, *V. fungicola* has demonstrated high levels of resistance to most other commercial fungicides, whereas *A. bisporus* has very little natural resistance. To avoid major losses, the mushroom industry must find novel and effective methods to control *V. fungicola*.

Randomly disrupting the genome of a pathogen using transformation that causes insertional mutagenesis combined with appropriate screening of the resulting mutants can allow isolation of genes involved in pathogenesis, thus providing potential targets for control. Prior to my project this summer, *Agrobacterium*- mediated transformation had been used to create a T-DNA knockout library in *V. fungicola*. This method provides a tag that indicates the location of the insertion. Preliminary screening had identified over 40 mutants that showed wild type growth on rich media but reduced growth on media containing mushroom cell walls.

My project was to further investigate the pathogenicity of the *V. fungicola* mutants, and carry out preliminary molecular investigations on those that displayed interesting phenotypes. Firstly, I cultured four transformants that had previously shown significantly reduced growth on *Agaricus* cell wall media. I grew these transformants on minimal medium containing *Agaricus* cell walls, supplemented with one of a number of simple nitrogen sources or carbon sources, at a variety of concentrations. The aim was to identify transformants whose phenotypes were rescued by the addition of one of these simple compounds, the implication being that their knockout is an enzyme involved in degradation of complex compounds in *Agaricus* cell walls. One transformant in particular, which I named RGC-44, showed a reduced growth on media containing a range of sugars and relatively little response to increased sugar concentrations

I extended the screen of mutants onto mushrooms *in vivo*. This involved suspending spores of the mutant strains to a known concentration, and inoculating mushroom caps. The caps were incubated for several days and the necrotic regions caused by the respective strains of *V. fungicola* were measured in size and scored for severity. All four strains showed reduced pathogenicity, most markedly RGC-44 growing at a rate 50% slower than wild type.

The T-DNA used to create the knockout library contained an *E. coli* gene for hygromycin B resistance (*hph*), which allowed initial selection of transformants. It also provided a region of known sequence that permitted me to design suitable primers and carry out PCR to demonstrate that the mutants indeed contained the T-DNA insertion. I also carried out Southern analysis, probing with the *hph* gene. Additionally, to establish the site of insertion of T-DNA, I performed thermal asymmetric interlaced PCR (TAIL-PCR) on 14 transformants. This technique involves three sequential rounds of PCR using nested primers and is used to recover genomic sequences flanking T-DNA insertions.

In addition to investigating transformants from the existing knockout library, I also conducted two experiments using *Agrobacterium*-mediated transformation myself. The aim was to produce *V. fungicola* transformants that expressed GFP when grown on *Agaricus* cell wall medium and mushroom caps, but not other media. This was achieved by transforming spores with *Agrobacterium* whose T-DNA contained the GFP gene regulated by a *V. fungicola* glucanase promoter. A number of putative transformants were created that are now awaiting further characterisation.

This project has been a rewarding experience. I have learned a wide range of important laboratory skills, but equally I have seen something of how science works in the real world from how a laboratory is run, to

how research is funded, from experimental design to the inevitable unforeseen complications. Most of all though, I ve really enjoyed it and I would like to thank the BSPP for funding me. Thanks also to my supervisor Dr. Gary Foster, my co-supervisor Dr. Andy Bailey, and special thanks to Richard Amey as well as everyone else in the Plant Pathology laboratory at Bristol University.

Jenny Bowers, University of Bristol

Investigation of the efficacy of a chitin synthase inhibitor on the prevention of clubroot disease

The soil-borne fungus *Plasmodiophora brassicae* is the causal agent of clubroot disease of brassica crops such as cabbage, turnip and broccoli, which results in major nutritional and economic losses worldwide. *P. brassicae* can survive in soil indefinitely as resting spores until the growth of brassicas stimulate their germination. The spores produce biflagellate primary zoospores that swim toward and attach to the surface of root hairs, leading to infection. Clubroot reduces the market value of root crops and land infested by *P. brassicae* loses its capital asset value, because rotations involving brassicas are prevented. A means of eradicating the resting spores or preventing infection by zoospores would therefore be of global benefit.

The resting spores of *P. brassicae* are known to contain two layers of chitin, so a chitin synthase inhibitor such as diiodomethyl-p-tolyl sulfone (amical) might inhibit some aspects of the life cycle. The aim of my project was to determine the efficacy of amical as a means of preventing or treating *P. brassicae* infection. Three different treatments were examined, firstly the effect of treating resting spores on zoospore germination and subsequent infection, secondly, the effect of treating seeds on zoospore infection and thirdly the effect of treating recently infected seedlings on the progression of the disease.

The early stages of my research were concerned with choosing the fastest germinating cabbage seeds from a number of different varieties and the conditions under which fastest germination occurs. Seeds of Manoko (Chinese cabbage) and Autoro (Red cabbage) grown in an incubator at 25 C for 48 hours showed best root growth and root-hair development and were consequently chosen for infection. The seeds were incubated in sealed petri dishes and on four layers of filter paper soaked with distilled water.

The resting spores were obtained from club root galls taken from heavily infected mature cabbages. The galls were removed, blended with water and centrifuged 5 times, each time discarding the supernatant and resuspending the pellet in distilled water. Microscopic examination established that zoospore production occurred after around 26 hours in the presence of germinated seeds, and root hair infection after a further 4 hours. Incubating seeds on filter paper soaked with spore solution and examining root samples after 48 hours showed zoospores attached to root hairs and thus established a model system for the investigation

Amical concentrations of 10 and 1 mg ml^{-1} were used. Due to its low solubility in water, it had first to be dissolved in acetonitrile before being diluted to the desired concentrations using distilled water. It was therefore necessary for me to investigate any phytotoxicity toward the seeds and seedlings of both amical and acetonitrile at their relative concentrations, and also to ensure that any effects on zoospore attachment would be due entirely to amical and not acetonitrile. These experiments showed that amical and acetonitrile had no adverse effect on seed germination at the concentrations used, and using a light microscope, no discernible phytotoxicity was observed after 96 hours of seedling growth. It was also discovered that acetonitrile had no inhibitory effect on spore

germination, and compared to the control, amical at 10 mg ml^{-1} resulted in fewer attached zoospores.

Treating the spore solution with amical at 10 mg ml^{-1} for a period of 24 hours prior to seed incubation resulted in a highly significant decrease in the number of attached primary zoospores in both cabbage varieties after 48, 72 and 96 hours growth some samples displayed a total absence of zoospores, whereas spores treated with 1 mg ml^{-1} amical or distilled water infected root hairs to levels of several thousand per 100 root hairs. Similar results were obtained when seeds were immersed in amical solution for 24 hours before incubated with resting spores. It appeared that amical had no effect on seedlings already infected by *P. brassicae* latter stages of infection were observed in all root samples. These results suggest that chitin synthase inhibitors could indeed be utilised as a successful means of controlling *P. brassicae* infection. It is therefore of great importance that further research into amical is carried out to confirm these results and possibly establish its use in the war against clubroot.

I also acquired evidence for the existence of a diffusible plant-derived factor causing the germination of resting spores. Seeds were grown for 48 hours, after which the remaining water was removed and used to make serial dilutions. 10 ml of each concentration were added to 10 ml of spore solution on glass slides and each examined after 26 hours. The original solution, 10^{-1} and 10^{-2} contained decreasing numbers of zoospores until below 10^{-2} no zoospores were found. Further research, perhaps using HPLC could be used to identify this g factor .

I believe that this invaluable laboratory experience has dramatically developed my practical skills and further enhanced my enjoyment of and interest in microbial research. I would like to thank the BSPP for funding my work and giving me the opportunity to experience research first-hand. I would also like to thank my supervisor, Dr Mike Mattey, for putting me forward for the BSPP Bursary, Dennis, for everything he managed to find during the last 10 weeks, and them both, for allowing my experience to be an enjoyable one. Thanks.

Dr Mike Mattey presented the abstract of this research at the joint Scottish Microbiology Society/BSPP symposium Plant Microbe Interactions at the University of Paisley on the 4 September 2002.

George McCallum, University of Strathclyde

Effect of mycelial carry-over on transmission of Mushroom Virus X dsRNAs into new crops

The white button mushroom, *Agaricus bisporus,* is the most important for UK production. In addition to classical La France virus, crops can also be infected by mushroom virus X (MVX), which was identified in 1998. This new virus had a devastating effect on British mushroom production, causing crop delay, suppression of mushroom initials, poor quality and occasionally brown discoloration of mushrooms. HRI-Wellesbourne has its own mushroom-growing unit, thus the epidemiology of MVX disease can be studied. The MVX team at HRI uses an electrophoretic test, which identifies the dsRNAs present in MVX infected mushrooms. RT PCR tests have also been developed for three specific MVX dsRNAs.

Virus diseases of mushrooms are usually transmitted as a result of hyphal anastomosis between infected and uninfected mycelia. The aim of the experiment I was working on was to determine if the continual carry-over of small amounts of infected mycelium from one crop to another would result in an increase in the MVX titre, and in the severity of the disease. I was involved with the production of inoculum and set-

ting up the first rollover experiment, but four further rollover crops will be set up after I finish.

The experiment required the production of four sources of inoculum: two *Agaricus bisporus* controls free of virus (A15 and A15-1) and two *Agaricus bisporus* cultures infected with MVX (BPH 1940 and BPP 2648). Mushroom compost (five replicates of 200 g) was inoculated with spawn made from each of the four cultures, and incubated at 25°C for 2 weeks. After this time, the compost was well colonised by mycelium. Small quantities of colonised compost were incubated on Petri dishes containing compost medium to provide mycelium for PCR tests. In addition, a small sample of colonised compost (5 g) was then removed from each treatment to inoculate freshly prepared batches of compost, containing uninfected healthy *Agaricus bisporus* spawn (A15), representing the first rollover crop. All remaining compost for individual treatments was then bulked together and cropped in the mushroom unit. Yields were recorded and the mushrooms frozen until they could be analysed for the presence of MVX dsRNAs.

Observations on the inoculum crop showed that the yields from the controls and BPP 2648 were similar while the yield from BPH 1940 was lower. Results from the PCR tests carried out on mycelium from the inoculum compost showed that at this stage only one treatment, BPH 1940, was positive for one MVX dsRNA. This treatment also gave the worst yield in the inoculum crop.

Yield results from the first rollover crop showed that yields from both the infected treatments were worse than the controls. In addition there was a noticeable delay in cropping of a day or two with the infected treatments. Unfortunately I did not have time to do PCR tests on rollover-1-mycelium before I left, but it will be interesting to see if more dsRNA bands are detected. The incubated compost from rollover crop 2 is currently in the process of being cropped and both infected treatments look much worse than the controls, or than the compost in rollover crop 1.

I would like to thank all the staff of HRI, particularly Dr Helen Grogan for her help and advice during my stay with the Mushroom Team. Thanks to these colleagues, I now feel more comfortable speaking and understanding English. It was very interesting to learn some agronomy, to see how a research laboratory runs, to discover useful technics in molecular biology. Indeed, my work plan for the future is be involved in research on bacteria and genetics.

Christelle Pinsard, Ecole National Superieure d Agronomie et des Industries Alimentaires, Nancy France

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Control of *Diplocarpon rosae* infection of rose leaves through manipulation of the plant s Systemic Acquired Resistance (SAR).

"If we knew what it was we were doing, it would not be called research, would it?" - Albert Einstein (1879-1955)

Rose Blackspot caused by the host specific facultative parasite *Diplocarpon rosae* fungus results in considerable damage to amateur and commercial Rose production each year. Growers spray fungicides regularly in an attempt to control the disease. Working as part of the plant pathology team at the University of Hertfordshire, my investigation focussed on the potential of manipulating the plant s ability produce its own resistance to the infecting fungus.

Systemic Acquired Resistance (SAR) confers the plant with non-specific protection against a broad range of pathogens, which is comparable to the best fungicides. The mechanisms of SAR are largely unknown, however it is believed that Salicylic acid

plays an important role as a signalling hormone. When applied as a simple compound salicylic acid has been shown to elicit an immune response in some plants. Induction of the SAR system increases expression of Pathogenesis-Related (PR) proteins, which are used to fight infection. One PR protein in particular, chitinase, could be manipulated to provide resistance to fungi, including *D. rosae*. Using a spray containing salicylic acid, and through soil amendment with chitin I hoped to elicit increased levels of SAR.

Plants were grown in soil amended with two different concentrations of chitin and comparisons drawn with plants grown in untreated soil. Leaves were harvested and challenged in the labs with a suspension of *D. rosae* spores and fungal growth noted after a week s incubation. In the field selected leaves from plants grown in treated and untreated soil were also identified and monitored to observe the rate of infection naturally. Separately, leaves of a few plants were sprayed with salicylic acid at two different concentrations and monitored for development of fungal growth.

Results from the harvested leaves showed significantly less infection on the leaves taken from plants grown in chitin amended soil as opposed to the controls, amendment with 50grams chitin performed slightly better than amendment with 100grams, possibly due to a phytotoxic effect of concentrated chitin. Spraying with salicylic acid was not as effective in preventing infection, though compared favourably with the controls. Monitoring tagged plants confirmed the ability of chitin to elicit a response defending the plant from infection by the fungus. Tagged salicylic acid sprayed plants also demonstrated increased levels of resistance towards *D. rosae*. However, the response faded 13 days after spraying, at which point the fungus could establish an infection and develop as quickly as in the untreated controls.

Following these preliminary studies molecular analysis would be the next logical step to confirm whether soil amendment with chitin actually produces an increase in chitinase production or whether the resistance observed is due to some other mechanism, possibly by increasing the population of chitin digesting bacteria in soil surrounding the plant. Analysing the response to elicitation from salicylic acid on a molecular basis would also provide us with a useful insight into the mechanisms of SAR.

Finally, I would like to thank Dr. Avice Hall and Alefyah Ali, my supervisors, all the technical staff at the University of Hertfordshire, and the BSPP for providing me with this opportunity. I gained a great deal for the whole experience, and was also privileged enough to attend the BSPP annual presidential meeting at Imperial college, London. Throughout the course of the project I improved and developed my laboratory skills and furthered my knowledge of the importance of good laboratory practice and good experimental design. These skills will prove invaluable as I progress to my final year of undergraduate studies and hopefully to further post-graduate work.

Ben Pascoe, University of Hertfordshire

Interactions between plant proteins and bacteria

This summer I spent 10 weeks working in the Molecular Genetics group at the University of the West of England under the supervision of Dawn Arnold. The groups work mainly concerns investigating avirulence and virulence genes from *Pseudomonas syringae* pathovars. My project was concerned with using an IAsys Plus affinity sensor to detect interactions between bacteria and plant proteins in real time. This technique monitors interaction between proteins by measuring very small changes in refractive index, and can give kinetic binding data in a few minutes. I was working with *P. s. pv. phaseolicola* (*Pph*); a patho-

gen of bean. The bacteria secrete effector proteins into the bean leaf, which are specified by virulence (*vir*) or avirulence (*avr*) genes. Specific, but as of yet unidentified, plant proteins interact with Vir and Avr bacterial proteins. I was working with VirPphA the protein product of *virPphA*, a *vir* gene isolated from *Pph*.

The IAsys Plus affinity sensor uses the surface plasmon resonance (SPR) angle at the surface of an IAsys cuvette. When a molecule is bound to the surface, the SPR angle changes. The SPR angle is dependent on a fixed wavelength and the refractive index of the surface layer. There is a linear relationship between the mass of protein bound per unit area and the change in SPR angle. Thus the change in SPR angle is proportional to the mass of protein bound.

Using an existing clone of *virPphA*, it was possible to express the VirPphA protein fused to a LexA binding protein. In an IAsys Plus affinity sensor cuvette, rabbit anti-LexA antibody was immobilised to the surface. The VirPphA LexA fusion protein was washed over the immobilised antibody. Binding was observed graphically between the immobilised anti-LexA antibody and fusion proteins, via a computer program. The next stage was to wash over cytosolic bean plant protein, with the aim of causing binding to occur between the VirPphA protein and the plant protein, so that the plant protein could be collected for characterisation. Unfortunately, however, binding did not occur with the plant protein and the fusion protein.

My project identified several technical problems that, given more time, can probably be overcome. The anti-LexA antibody used to bind the fusion protein in the cuvette was polyclonal. As a consequence non-specific binding was occurring with other proteins expressed at the same time as the VirPphA-LexA fusion protein. Also specific binding that did occur was weak, and the amount binding was so little it could not be detected by Western blotting. Non-specific binding also took place with the immobilised anti-LexA antibody and the crude plant protein. To overcome these problems, a monoclonal anti-LexA antibody is available commercially that could be used to immobilise in the cuvette. Also purified VirPphA-LexA fusion proteins may improve success and I began some work to clone *virPphA* into a different vector that would mean more efficient expression and purification of VirPphA. Also, because of the sensitivity of the IAsys Plus affinity sensor, the response induced by differences in buffers used to equilibrate the sensor and resuspend protein samples must be overcome and an optimum pH for the experiment needs to be defined.

It would seem there is scope for future research using the IAsys Plus affinity sensor in this field, but unfortunately for me, my time with the project ran out. My 10 weeks working with the Molecular Genetics Group at the University of the West of England has been a fascinating experience and insight into the world of research. As an undergraduate it has been a valuable opportunity to gain practical experience and cement my understanding of theory learnt during my degree so far. As a consequence my confidence has greatly increased and I hope in the future to be able to apply some of my experience gained in the field of molecular plant pathology.

Sarah Usher

TREASURER WANTED

See page 47

A week in the life of

a molecular plant pathologist?

Graeme Down

A friend of mine has decided to become an MP. There are many characteristics and qualifications needed for this role. However, when I discover that one of these is the ability to produce AFLPs of the genomes of five separate species, I know something is wrong. Seconds later, I wake in a cold sweat. It s another molecular biology nightmare.

Luckily, despite my putative status as a molecular plant pathologist at HRI-East Malling, I see relatively little of my old buddy the PCR machine these days. A multitude of other tasks compete for the limited hours each day, ranging from producing an annual report for an EU project through to putting out the bins (some would debate which contains the more garbage).

No two weeks are ever identical, and I quite like it that way. So here s a typical unique week at East Malling.

Monday - Straight away, there is a problem to solve. Then again, I created it, so I can t really complain, though I probably will if given the chance. Attending the ICPP in New Zealand in February, I made use of some project money, that it turns out I should have got written permission to use. Oops. Fortunately it turns out that I am not too late to retrospectively transfer that to another grant (which shall remain anonymous). Lots of emails to reply to and act upon. Not from the weekend of course if only I was in that much demand! No, these are all from weeks if not months ago, awaiting that spare five minutes that never quite seems to materialise.

After these Monday morning issues have been cleared (under the carpet if possible), its time to determine what is going on with our disease resistant Acer plants. This has been a tricky project, which has seen one retirement, one redundancy, and one person leaving through choice, not to mention that I only arrived half way through. Hence, a great deal of head scratching is often required to solve what might be fairly simple issues. But we get there (or at least I send two emails).

Spend a large part of the afternoon scanning increasingly improbable candidate organisations for funding a trip to Slovenia, to talk about PCR detection of hop wilt. It s looking a remote possibility that I will go, which is most unreasonable considering I have only been to New Zealand and Poland in the last 4 months.

Just to finish the day, a daunting task - tidying the office. Bits of paper, buried squirrel-like in the Autumn, are found mouldering under the desk, along with the odd sports sock, the only surprise being I don t turn up any hibernating squirrels.

Tuesday - Start by moving our Acers from poly-tunnels to the outside environment. Since they are about 30 seconds walk from

my house, this should be an easy start to the day. However, just to make life hard for myself, I have forgotten to bring the key to the gate, and end up making a 30-minute detour to the lab to get it.

The plants are well rooted into their sand beds, and it takes considerably more effort than I expected to move all 400 of them to where a trailer can be loaded. After moving them, I then discover that Michael Fish has forecast a slight frost for the night. Remembering his infamous hurricane forecast of 1987, I take this to mean that unprecedented polar conditions will seize the East Malling area, and spend frustrating amounts of time arranging to have the delicate plants covered.

Back in the lab, things are a bit more fun. We are testing out a new prototype machine for sampling *Verticillium dahliae* in soil. Prepared in Holland, this bulky, metal, contraption somehow cleared customs with me, despite having the passable appearance of a bomb. Violence is a part of its use, as it must be hit three times with a hammer to operate effectively. One female colleague has commented that it looks as though designed by a man. Whatever can she mean? Funnily enough, she s right though.

After lunchtime football, slump behind the computer screen. No one will disturb me now the sports kit strategically placed near the office door will see to that. Start working on the paper for the Slovenia trip, but this is hard going when I am fairly confident I won t get there to give it. Give some time to preparing bids for future funding, then turn to writing up some papers. Now where was it, the one I started 18 months ago ?

Wednesday - Hurrah, the Acers seem to have survived the (penetrating) frost. Today, we turn to potatoes, a glasshouse with 400 in, that need assessing for wilt. I was assured by a reliable source that this variety would succumb with ease. Thus far, they most certainly have not. Entering the compartment is like trekking into the Amazon. Giant plants rise from benches on all sides. Water drips from all surfaces. The odd parrot has appeared. Two paces in, and if you ve forgotten the compass, you ve had it. Please, start wilting soon!

In the afternoon, I go to the other extreme, and brave the brisk, chilly wind across the field plots, to check on the hops we planted in February. The plucky plants are forcing their way up through the soil, though they must wish they hadn t bothered on this unseasonably cold day. For many of them, this effort will be in vain, largely due to the sizeable clump of *Verticillium* coated straw that went into the ground with them.

Back to the office, to find a query about adding slow-release nitrogen to these very hops. Pass. I know how to check them for wilt, and can confidently perform a quantitative PCR on them, but complicated aspects like making them grow? I hasten to find my predecessors files.

And at last, I get to run a PCR. No week would be complete without one.

Thursday - A day out. Only to our sister site at Wellesbourne, so I m not getting too excited. We are going to have a look at real-time quantitative PCR, as we may wish to use the technique soon. I have agreed to arrive at 10.30, which means I will arrive at 11 or later, thanks to the road to hell that must be negotiated to get there. Once there though, we have a useful day, and I remember the basics of the technique, having used it three years earlier. We take some soil samples with *Verticillium* in and run them through the machine. I decline the kind offer to hang around until the results are ready, since I fancy being home by midnight. Look forward to receiving the results though, since we know how many colonies were viable per gram of soil. Will it match with the DNA levels?

All will be revealed .,but not this Friday , since I am working a four day week, and its time to concentrate on things other than horticulture.

CONFERENCE REPORTS

6th conference of the European Foundation for Plant Pathology, 8 13 July 2002 Czech University of Agriculture, Prague

The 6th Conference of the European Foundation for Plant Pathology was focussed on reporting important developments in all aspect of plant disease resistance. Plant disease and host-pathogen interactions are two of the main components of my PhD research project, and the BSPP travel grant awarded for me to attend this meeting provided a great opportunity to see the latest advances in these topics. The conference was held at the Czech University of Agriculture in Prague and the organisers paid particular attention to bringing together scientists and plant pathologists from Western Europe and the former East Europe.

The conference opened officially on Sunday 8 July with delegate registration and a welcoming cocktail party, livened by the presence of a group playing traditional Czech music. The conference presentations began next day, continuing over for four intense days. The programme was arranged into four major themes: Plant Disease, Host-Pathogen Interaction, Resistance and Disease Management. Keynote speakers presented the latest results from of their research and a large number of short presentations were selected from attendees. This format created a thought-provoking atmosphere where scientists with diverse backgrounds and experiences (from group leaders to young PhD students) could present their work. Certainly, arrangement stimulated exciting and open discussion. And special attention was given to considering how new scientific understanding might contribute toward effective and sustainable disease management in practice.

The conference opened with a lecture presented by Prof. Kudela (Research Institute of Crop Production, Prague, Czech Republic), who reported a comprehensive summary of plant pathology (and plant pathologists) in the Czech republics. The session also contained a presentation from Dr Pink (Horticulture Research International, Warwick, UK) of plant resistance and strategies for breeding resistant varieties. He explained why the production of resistant varieties did not lead to a permanent means of controlling plant disease and suggested how we might improve our knowledge in this field. Furthermore, Prof. Martelli (Instituto di Virologia Vegetale, CNR Bari, Italy) gave a critical appraisal of non-conventional resistance to plant viruses. In addition to presenting recent progress in developing transgenic resistance to plant viruses and the success of virus-resistance cropping, he argued that in Europe there is still a widespread sentiment against agriculture biotechnologies, particularly the use of genetically modified plants. However, he explained that experimental evidence is accumulating, which

shows the risks feared to be associated with genetic transformation are minimal, if not negligible, in many cases.

The programme was divided into twelve different sections, but none of them were in parallel, so delegates had the opportunity to attend all the presentations and discussions. From the many interesting and provoking presentations, I would like to report a short summary of a few that were for me especially outstanding.

Prof. Elstner (Lehrstuhl fur Phytopathologe, Techische Universitat Munichen, Germany) synthesised a model describing the sophisticated set of chemicals utilised by plants as defence signals. He explained how the complex interactions of reactive oxygen species (H_2O_2), hormones (ethylene), calcium fluxes, small effector molecules (salisylic acid, nitrogen oxide) and protein phosphorylaton cause yield defence responses such as phytoalexin- and PR-protein synthesis and wound sealing by callose and lignin. An excellent presentation was offered by Prof. Michelmore (Department of Vegetable Crops, University of California, USA) on the genomic approaches to natural and artificial evolution of plant disease resistance genes. Besides the introduction of an *in vitro* DNA shuffling to determine the functional consequences of genomic rearrangements, Prof. Michelmore also presented the birth-and-death model, which describes the evolution of defence genes, using data on the relative frequencies of genetic events in cluster of resistance genes in *Arabidopsis*, tomato and lettuce. Finally, the last presentation I would like to mention was offered by Dr Holub (Horticulture Research International, Wellesbourne, UK) on genetics of disease resistance in *Arabidopsis* to crop pathogens. He presented very practical research focused on the identification of R-genes in *Arabidopsis* that are responsible for conferring resistance to brassica pathogens, and could therefore be used to proffer defence to the same pathogens in crop brassicas.

Delegates had the opportunity to observe and discuss more than one hundred posters. The research projects presented in the poster session summarised a very wide range of fields in plant pathology. The opportunity to discuss research results with scientists from across the world was very informative and stimulating.

Finally, I would like to remark on the open discussion that concluded the conference. Although only a minority of the delegates were present, a lively and interactive debate on genetically modified organisms took place. One conclusion from the discussion is that there is very divergent perception and opinion of GMO across the scientific community and general public. This is partly due to a number of events and communication mistakes that have caused the public to perceive scientific reports with suspicion. Apart from improvement in scientific understanding of plant disease and host-pathogen interactions, a major challenge in the next few years, will therefore be to regain public trust and confidence in scientific research.

Andrea Chini

SEVENTH INTERNATIONAL MYCOLOGICAL CONGRESS
OSLO, NORWAY, AUGUST 2002

The 7th International Mycological Congress was held at the University of Oslo, Norway. Oslo was a wonderful setting for this meeting of fungal biologists, being surrounded by forests and lakes, a great diversity of fungi, and legends like Elias Fries, and of course the Vikings, who operated in the area. For one week more than a 1000 mycologists, representing over 80 countries, converged in the land of the Vikings, to talk, sleep, learn and share passion about mycology.

The organisation surrounding so many mycologists, as well as 450 oral and 750 poster presentations, post congress tours, social events and all the other sides to an international congress, is not a task to be taken lightly. From the start, with the efficient handling of registration, abstracts, etc. it was evident that Leif Ryvarden and his organising committee had things under control. And looking back on the conference, the committee has to be commended for the excellent organisation throughout, with not one major problem during the whole time (or that we were aware of at least).

The five conference days were split into five parallel Congress Symposia and Poster Sessions each morning, and 10-12 parallel Contributed Symposia in the afternoons. With this many competing talks, one felt the inevitable frustration of having to decide which of several equally interesting talks to attend. Fortunately the auditoria were all within a 100m or so, making session hopping a little easier. Gareth found himself speaking about *Crinipellis perniciosa*, anaerobic fungi and *Hygrocybe* ecology in consecutive sessions (only himself to blame). Fortunately those were early in the week and he could relax a little thereafter. Bernard had to wait until the last session on the Friday afternoon, which ran concurrent with eight other sessions, to share his work and ideas about the symbiosis between woodwasps and Basidiomycetes in the genus (*Amylostereum*).

A meeting of this magnitude and diversity, affords one the opportunity to both converse in your own field of interest, as well as to broaden your vision of the whole field (in this case mycology). The topics of the various sessions covered all of mycology: from asexual to sexual, aerobic to anaerobic, decomposers, pathogens, endophytes, obligate symbionts, Basidiomycetes to Oomycetes. And all environments, from the arctic-alpine regions, the rusts of the dry harsh Namibia and homobasidiomycetes of the dry, icy Greenland, truffles in Australia, aquatic *Haplophytophthora*, xerophilic fungi that spoil food and a lot in between. What amazing organisms we study! It was evident in all of these fields that molecular techniques have become established as a major tool for testing biological hypotheses. Increasingly, information from molecular data is mapped successfully to phenotypic and ecological data, which is bringing great insight into the biology of fungi and life in general.

Among the plant pathology highlights for us were Rick Howard s talk on 4-D laser scanning microscopy, with the audience supplied with 3-D spectacles to appreciate the wonderful images and movies of *Magnaporthe grisea* hyphae *in planta*. Clive Brasier s session on Hybridisation as a force in fungal evolution and pathology was also fascinating, illustrating the range of dark tricks that pathogens as diverse as *Phytophthora*, *Ophiostoma* , *Heterobasidion* and *Melampsora* have up their sleeves. Other sessions reinforced the significant role man plays in phylogeography and moving pathogens across the world;

which poses an ever increasing threat for plant diversity and plant production worldwide. From a below-ground perspective it was also apparent that the division between the various types of root-infecting fungi (mycorrhizas / pathogens / endophytes / etc.) are blurring with PCR-based methodologies revealing the great diversity of ascomycete fungi present within healthy plant roots. Many of these are sterile in culture and have tended to be lumped together (and generally ignored) as dark septate endophytes. Some have been shown to be beneficial to their hosts, so given their widespread occurrence in a range of natural and agricultural systems they may be important determinants of plant health.

Article 59 of the ICBN, which governs the use of anamorph and teleomorph names of pleiomorphic fungi, was a central feature at IMC7. After some presentations covering the history, implications and case studies, a formal debate about the issue was held between a Pro Art.59 team (Profs. W . Gams, R. Korf, J.I. Pitt) and the anti dual nomenclature team (Profs. D. Hawksworth, P.M. Kirk, M.L. Berbee). Molecular systematics is making it possible to determine the phylogeny of an organism, irrespective of its expressed morphology. This is increasing the pressure to abolish the dual nomenclature for different morphs. On the other hand, dual nomenclature is deeply rooted and serves a very useful purpose in communication on fungi and their unique live cycles. Abandoning or changing Article 59 might cause unacceptable disruption. Changes seem inevitable, but there is much work and debate still necessary to fully resolve the issue. Although this is a debate that has to be resolved in mycological circles, it is essential that plant pathologists contribute to the thinking. After all, our field will be one of the most severely affected by any change in the use of teleomorph and anamorph names. Not only for academic communication, but also, and perhaps more importantly, with outside, non-specialised users.

Amongst the social highlights was the opening reception at the spectacular Oslo Concert Hall. Here delegates were surprised by the appearance of Elias Fries, who gave a sober seventeenth century view of modern day mycology. The by now notorious (but highly enjoyable) Wines of the World evening stimulated great social interaction. In a country where beer costs £5 per 500ml, it is not difficult to guess why this event was a sell-out. Another highlight was the gala dinner, with traditional Norwegian folk music and food, including local wine, selections of wild mushrooms and berries, and deer.

We are most grateful to the BSPP for awarding us travel awards to attend this fantastic meeting. For those of you who missed it the conference programme (7Mb!) and the conference abstracts in their entirety are available in pdf format from http://www.uio.no/conferences/imc7/. It is worth noting in your diaries that IMC8 will be held in Cairns, Australia in 2006.

Gareth W. Griffith and B. Slippers

I had been very much looking forward to this congress and my expectations have not been disappointed! After arriving late in Oslo on Sunday evening - missing the opening ceremony for me the congress started immediately after registration on Monday morning with hanging up my first poster and visiting the first session. Choosing the sessions was not an easy task and had taken considerable planning since there were 70 sessions divided across five main themes ("Biodiversity and Conservation", "Systematics, phylogeny and evolution", "Pathogens and nuisances, food and medicine", "Popu-

lation dynamics and ecology", "Cell biology and physiology"). The first I attended was on "Plant- pathogen interactions in woody plants" and was organized by two well-known researchers in this field: H Solheim and S Woodward. The defence systems of woody plants (especially conifers) to fungal pathogens and the fungal elicitors of the host response like *Sphaeropsis sapinea* and *Heterobasidion annosum* as well as *Ceratocystis polonica* were discussed. The talk about *C. polonica* was especially interesting for me since we also work with this bluestain fungus at our institute. An informative talk by C Mohammed described the defence system of the economically important *Eucalyptus* species. In the afternoon, I attended the session with maybe the most catchy title: Sex and murder: the extraordinary fungal life cycle . Here, GW Beake s talk about the fascinating nematode pathogen *Haptoglossa* shone out because it was given in the form of a classical detective story, without loosing the scientific perspective.

Tuesday for me started with an impressive session on the current findings in evolutionary trends in fungi. From more basic analysis of methods for managing phylogenetic uncertainty (M Pagel) to Molecular phylogenetics and breeding system in the ascomycete fungi (ML Berbee). ML Berbee discussed the very interesting question of asexual and sexual fungi, the former according to her findings obviously have lost this trait during their evolution. At the end of this session the ambitious AFTOL project (Assembling the Fungal Tree of Life) was briefly discussed, which will provide data on morphological and genetic traits of approx. 1500 fungal species from all orders. In the afternoon the fascinating new findings concerning mating and compatibility genes in fungi was discussed. Both ascomycetes and basidiomycetes were covered. Most interesting for me was the mating mechanisms in homothallic *Ceratocystis* species well presented by TC Harrington. Apart from the importance of understanding mating mechanisms in these fungi, sequence data of these idiomorphs can be compared between the different species and provide additional data for phylogenetic reconstruction.

Wednesday morning held the most important session for me in the program, since it was connected to my own work: Hybridisation as a force in fungal evolution and pathology . This included talks about *Epichloº* species, *Tilletia* species, *Heterobasidion*, *Phytophthora* and *Melampsora* hybrids (G Newcombe). The most impressive talk however was given by CM Brasier on hybridisation between the two Dutch elm disease pathogens *Ophiostoma ulmi* and *O. novo-ulmi*. In their important work Brasier and co-workers were able to show that *O. novo-ulmi* (which has replaced *O. ulmi* as the most important Dutch elm disease pathogen) has acquired most of its diversity, in vegetative compatibility alleles and one mating type idiomorph, from *O. ulmi* through interspecific hybridisation. This talk pointed out what tremendous impact this little explored evolutionary factor can have on fungal pathogens.

The next significant session for me took place on Thursday afternoon in the Taxo-

nomic Aspects of *Ophiostoma* and *Ceratocystis* and their relationships with hosts, vectors and effects on international trade . An impressive array of presentations showed the current intensity of research with these fascinating fungi. For example, T Kirisits reported on exciting new species of ophiostomatoid fungi found in a survey associated with bark beetles in Bhutan. K Jacobs reported on the current situation of *Tetropium fuscum* and its associate *O. tetropii,* which have both been introduced to Canada. Apparently there was some confusion about *O. tetropii* because no type material of the species was available. And more than 20 years of research on the Dutch elm disease pathogens was summed up by CM Brasier, who discussed the pros and cons of sex and clonality for *O. ulmi* and *O. novo-ulmi.*

Friday was started off with a hot topic: "Anamorph and teleomorph classification in concert?" The pros and cons of the dual nomenclature were elaborated by several prominent speakers. D Hawksworth led the team against dual nomenclature and the amendment of Article 59 of the taxonomic codebook, while the opposing team was led by W Gams. Each team presented their point of view and were also given opportunity to comment on those of the opposition. Although a single name for one specific fungal species would be very practical, missing sexual stages or predominance of one fruiting structure make researchers reluctant to use a single genus name for anamorphic and holomorphic species - although molecular genetic data clearly put them together. This session was topped by a vote of the attendants whether Article 59 should or should not be changed in favour of the single name nomenclature. This difficult question will have to be resolved in future meetings. Opinions on this matter are quite divergent, as evident from discussion between the two teams.

Several social events during the week gave the opportunity to get to know new and old acquaintances better. These started on Monday at the welcoming reception by the mayor of Oslo in the impressive setting of the City Hall. On Wednesday evening the next social event took place in the form of the W ines of The World Evening . This was a very nice opportunity get into contact with congress delegates one hadn t yet met in the sessions and to taste wine from diverse and exotic locations. The Congress Dinner was held on Thursday evening, where attendants were spoiled with an excellent meal containing only Norwegian ingredients. Entertainment was provided by a local choir and dance music. Saturday, scheduled for the Closing Ceremony, arrived far too quickly!

I am very grateful to the BSPP for financial support to my travel expenses.

Heino Konrad, Institute of Forest Entomology, Forest Pathology and Forest Protection
Vienna, Austria

Scottish Microbiology Society/British Society for Plant Pathology joint meeting on plant-microbe interactions

University of Paisley, September 2002

The Scottish Microbiology Society aims to provide a scientific and social forum for microbiologists based in Scotland and holds two one-day meetings each year. Meetings are informal and aim to encourage presentations by postdoctoral fellows and students. The 14th Symposium considered the general topic of Plant-Microbe Interactions and was held in conjunction with the BSPP.

The meeting started with a presentation by the guest speaker, Professor John Mansfield (Imperial College at Wye) who discussed the contribution of both bacterial and plant processes on the development of plant disease in a presentation entitled Bacteria v Plants: evolution of tactics for attack and defence . The presentation considered the mechanisms used by pathogens to overcome plant defences, the involvement of a type III secretion system for translocating bacterial proteins across the plant cell wall, and how plants have evolved to recognise certain virulence genes generating varietal resistance. This was followed by a presentation by Dr John Jones (SCRI) on the virulence processes used by plant parasitic nematodes. He described the characterisation of a number of proteins secreted by nematodes that allow them to overcome plant defences. A number of the genes required for nematode pathogenicity have been shown to be acquired by horizontal gene transfer from phytopathogenic bacteria. The morning session finished with a consideration of the arbuscular mycorrhizal symbiosis by Dr Lucy Harrier (SAC). An overview was given of ongoing work looking at the molecular changes that occur during the plant-fungal interaction.

The afternoon session involved a series of short offered presentations. Dr Gary Lyon (SCRI) described the development of a searchable web database, known as DRASTIC, summarising information on genes differentially expressed during infection and other stresses. In addition, the benefits of introducing a Nucleotide Function Code for gene classification were discussed. Student presentations were started by Shuang Li from the University of Aberdeen who described the peptide fingerprinting of *Phytophthora infestans* secreted proteins aimed at identifying avirulence determinants. Jacqueline Heilbronn (SCRI) described the identification of potato signalling genes that are up regulated following infection by *Erwinia carotovora ssp. atroseptica*. Maria Holeva (SCRI) described the characterisation of the *hrp/dsp* gene cluster of *Erwinia carotovora ssp. atroseptica* and the subsequent generation of mutants with a view to identifying a role for the gene products in pathogenicity and host specificity. The final presentation by Dr Mike Mattay (University of Strathclyde) described the use of

a chitin synthetase inhibitor to control club root disease of brassica crops caused by *Plasmodiophora brassicae*.

In addition, there were a number of poster presentations on different aspects of plant-microbe interactions. The prize was won by David Walsh from the SAC for his poster entitled Gene identification in the pre-symbiotic stage of the arbuscular mycorrhizal fungus *Gigaspora rosea* (Beg 9) by expressed sequence tag analysis .

The meeting was a great opportunity for Scottish Microbiologists and Plant Pathologists, particularly students and post-doctoral researchers, to meet and discuss their work in an informal setting, especially during the cheese and wine reception! The organisers would like to thank the British Society for Plant Pathology for their support of this meeting.

Eastgate

6th International Conference on *Pseudomonas syringae* pathovars and related pathogens

The conference was held in a cliffside hotel in the village of Acquafredda di Maratea, 7km south of Sapri and about 2 hours south of Naples, Italy. Getting to the hotel was quite a trek, with many people flying into Rome and then taking the 4hour train journey to Sapri. Transfer to the hotel was enough to test the strongest constitution as the road wound around the cliffs, at times 500 feet up above a sheer drop, and the hotel minibus driver was clearly in training for the Ferrari formula 1 team! However, the conference organiser Professor Nicola Iacobellis made up for the journey by doing a marvellous job of arranging the conference in a hotel with a spectacular setting and excellent facilities and for attracting, via the international organising committee, several of the world leaders in the field. Sessions were held on Monday, Tuesday and Thursday, with a social (networking, honest!) trip on the Wednesday.

Cindy Morris started proceedings on the Monday with an excellent talk that brought together aspects of both basic and applied biology for studying and combating *Pseudomonas syringae* pv. *aptata*, a serious pathogen of cantaloupe melon in France. Jean Michel Monier gave a very interesting talk describing some elegant experiments he carried out in Steve Lindows lab to study bacterial colonisation on plant leaf surfaces. By using epifluorescent microscopy, he was able to observe Gfp-expressing bacteria aggregating on leaf surfaces and this could be for optimal stress survival. Bacteria existing near veins and glandular trichomes appeared to survive better than bacteria located on other parts of the leaf.

George Sundin was asked to give an overview of how *Pseudomonas syringae* deals with environmental and plant-associated stresses. This was one of the best talks of the conference for me as he described, for instance, some of the genes employed by bacteria in coping with DNA damage from solar radiation. A pair of genes, *rulAB*, are often acquired on plasmids by *Pseudomonas syringae* and these act as an upgrade to the cells defences against DNA damage. They are dispensable for resistance to UV damage, but if the bacterium carries the genes then the bacteria can survive for longer than strains not carrying the genes.

Advances in the elucidation of the regulatory mechanisms behind expression of type

III protein secretion genes were nicely described by Steve Hutcheson. Major progress in the understanding of negative regulators was described and clearly the challenges in this field are to understand how environmental signals are transduced to deactivate negative regulators, like Lon protease, to allow activation of the type III genes. Steve also described the finding that AvrPphD, an effector protein recognised as an avirulence determinant by some plants, has tyrosine phosphatase activity, a trait found in virulence factors of mammalian pathogens. This presents a new route for researching pathogenicity in plant pathogens as AvrPphD may be targeting MAP kinase proteins in plants.

From the offered papers, Francisco Cazorla described a nice piece of work about a very small protein (<3 Kda) called mangotoxin, which targets amino acid pathways and may be involved in the competitive inhibition of Gram-positive bacteria. Helge Weingart told us about how *cma* genes (invoved in coronatine toxin expression) are differentially expressed in different pathovars of *P. syringae*; one is temperature-dependent while the other is type III-dependent, clearly showing different strategies employed by pathogens to express virulence genes.

On the Monday night Alan Collmer organised a discussion group to address certain areas of research that required a community decision. This included the possibility of having another *Pseudomonas* plant pathogen genome sequenced and to try to agree a common theme for designating effector genes. The latter issue has been a major topic for years and still no unanimous decision could be reached.

On the Tuesday, we had several of the world leaders in Type III gene research, including Jean Greenberg, Barbara Kunkel, Shen Yang-He, Carol Bender and Jim Alfano, presenting. All described advances in mining genomes to fish out new effectors, to confirm that the effectors were likely to be true candidates through predictive methods and to study what the targets of effectors are. The bottom line was . Put your hard hat on, mining effectors might be a bit late - they ve done it all! . Suvi T aira presented the European effort (in collaboration with John Mansfield and Martin Romantschuk) for examining Hrp pilus biology. Zoltan Klement described the early induced resistance response of plants to pathogens that is triggered by bacterial surface molecules.

Thursday saw a mixed day, mainly dominated by diagnostics and taxonomy. Charles Manceau, Anne Willems and David Stead gave good talks describing efforts to properly classify plant pathogens with different molecular methods and Marco Scortichini and Arantxa Rico described efforts to classify *P. savastanoi* pv. *phaseolicola* and *Pseudomonas avellanae*, pathogens of bean and hazelnut, respectively.

The trip on Wednesday was by coach through the winding mountainous region north-west of Sapri, firstly to see how buffalo milk mozzarella is made. The farm contained 504 buffalos, of which only one lucky one was a male. The cheese was very tasty, with a yoghurt flavour. We then moved further north to Pompeii and a walk around the site for 2 hours. I found it quite a moving place, particularly when you see the plastercasts of the bodies. The site is huge (apparently it would take 2 days to get around it properly) and it is incredible just how advanced and inventive the people were for instance, they used marble as cats eyes in paths to guide themselves in the dark.

We arrived back and had a quick dinner. Then, 15 delegates took up the challenge laid down by Professor Iacobellis. A conference football team, named Dynam Syringae (courtesy Ian Brown), was to attempt to win the Acquafredda cup from the current holders, the Italian hotel staff. Manager Peter Ott and I organised a team of British, German, Hungarian, Turkish, French and American players and we congregated in Acquafredda Stadium, a clay

pitch under floodlights and dominated by the mountains above us. About 60 delegates came to support us and the atmosphere was electric. It was a 7-a-side match on a sized pitch played over 60 minutes. The Italians showed their class immediately by storming into a 9-3 lead. John Mansfield soon earned himself the nickname The Cat with his gymnastic efforts keeping our goal and certainly ensured that the Italian tally wasn t higher with some brilliant saves. Fortunately, we had a couple of secret weapons. Andrew Chopper Pitman, a semi-professional player in Britain, dominated defence, midfield and attack with runs down the wing and sweeper movements. His 5 goals brought us back into the game. Then, David Jones (10 year old son of Jeff) proved to be very capable against adults and scored a cracking goal, proving that he stands a good chance of making the American national team. Bob Coutts obtained a worthy hatrick to keep Dynamo in the chase. Matthias Ullrich was an excellent referee, which was enhanced as he happened to be dressed all in black. Needless to say, we all gave him the obligatory (friendly!) abuse for missing the fouls!! The second half proved the turning point for Dynamo, as our strength in depth squad pulled back the deficit (although it did help that we played 9 players for the last 10 minutes!). George Sundin and Jim Alfano proved that Americans have a right foot with great efforts on the pitch and Boris Vinatzer was throwing himself all over (literally). In the final minute, Dynamo managed to grab a hard fought over equaliser to make it 12-12 and we were into penalties. David Jones took a pressure penalty to keep us in the game and scored probably the best of the lot, with a goal that Michael Owen would be proud of. Alas, it wasn t to be, the Italians showed they had a stronger nerve and they beat us 7-6. But the real winner was the *Pseudomonas syringae* community!

This event really brought everyone together, from Profs. to PhDs, and from then on the atmosphere was much more casual and relaxed. This was reflected on the final night (Thursday) when Carolee Bull asked several of us to read out limericks after the dinner, which she had compiled about the meeting. Then, 25 of us, including several Profs (not just the young uns!) went for a midnight swim and diving off a boat, off the hotel beach. All in all, this was one of the most remarkable meetings I have ever attended because of the social events having such a positive outcome on generating a better community spirit and enabling people to develop closer links in their research. The science was of an excellent standard and one of the telling points was how important genome sequencing is. So many people are utilising the genome sequences of *Pseudomonas* (including *P. fluorescens*, as described by Gail Preston) for different aspects of research and finally we are starting to see some biological data deriving from it rather than just the usual lists . The *Pseudomonas syringae* community is also leading the way in certain areas of research, for example Type III secretion pilus research, effector protein function and colonisation traits. The future looks very rosy indeed.

I am very grateful to BSPP for providing me with a travel award to attend this conference and present an oral paper.

Football squad (nationality and goals in parentheses):
Dynamo Syringae Director: Nicola Iacobellis (Ita), Manager: Peter Ott (Hung), Goalkeeper: John Mansfield (UK), Outfield: Andrew Pitman (UK, 5), George Sundin (USA, 1 pen), Zoltan Bozso (Hung, 1), Alexander Schenk (Ger), Charles Manceau (Fra), Bob Coutts (UK, 3), Robert Jackson (UK), Helge Weingart (Ger, 1), John Thomas (UK), Jens Boch (Ger), Hassan Amouneh (UK), Jim Alfano (USA, 1+1pen), Meric Ozanak (Tur), David Jones (USA, 1+1 pen), Julian Smith (UK), Boris Vinatzer (USA).

Robert Jackson

The 6th International Conference on *Pseudomonas syringae* pathovars and related pathogens (September 15th-19th) was held at the hotel Villa del Mare, close to Acquafredda di Maratea, in the Basilicata region of Italy. The organisation, led by Professor Nicola Sante Iacobellis, was perfect; from the choice of the idyllic location to the scientific programme and social events. The conference was attended by 120 participants and its relatively small size provided plenty of opportunities for scientific discussions.

After the official opening ceremony, we started the scientific programme with a session on Ecology and Epidemiology. Cindy Morris gave an interesting talk on bacterial blight of cantaloupe melons (caused by *P. syringae* pv. *aptata*) in France. This disease has been considered a natural disaster in certain regions of that country and it is difficult to understand why it is so important in France and not in other producing countries. George Sundin talked about mechanisms and strategies of stress resistance, and especially about tolerance to desiccation and UV light; pathogenic strains of *P. syringae* seem to be more fit and able to survive under dry conditions than non-pathogenic strains. The DNA repair mechanisms of *P. syringae* might contribute to higher fitness and pathogenicity of some strains. In the session on pathogenesis and determinants of pathogenicity, Alan Vivian showed that it is possible to differentiate most races of *P. syringae* pv. *pisi* through multiplex PCR and explained how curing plasmids can help us to understand the pathogenicity determinants of different races. An one important conclusion of this work was that effector genes are redundant in nature. Dallice Mills also gave a very interesting talk on how the similarity between genes of the *hrpM* locus of *P. syringae* pv. *syringae* and the *mdoA* locus of *Escherichia coli* helped to elucidate the organisation and function of *hrpM*. After dinner, I attended the functional genomics workshop organised by Alan Collmer. The main issues debated were: which *P. syringae* strain should be sequenced next (pv. *phaseolicola* seems to be the best candidate), how the web site with the complete sequence of *P. syringae* pv. *tomato* DC3000 should work, and how new effector genes should be named. This last issue generated a lot of discussion.

The second day began with a session on Genetic and physiological analysis of host pathogen interactions. Barbara Kunkel gave a talk on the function of the *P. syringae* AvrRpt2 virulence factor. AvrRpt2 promotes virulence inside the plant cells, but it does not seem to be related to known defence genes. Barbara is now asking the question does AvrRpt2 alter auxin physiology? Zoltan Klement gave an interesting talk on early induced resistance (EIR). Pathogens and non-pathogens are able to induce EIR. In incompatible interactions, under certain conditions (e.g. high temperature), the EIR can prevent host response and the plants remain symptomless. In the session on Molecular characterisation/genomics, Gail Preston talked about the sequence of *P. fluorescens* and highlighted similarities between the type three secretion system (TTSS) of this species and *P. syringae.* And Jim Alfano concentrated on mining the genome sequence of DC3000 for *hop* (Hrp outer protein) genes that encode TTSS substrates. In the Disease management and control session, Larry Claflin talked about control measures for *P. syringae* pathovars whilst David Sands explored the possibility of using plant pathogens to control weeds; the development of bioherbicides is difficult because most pathogens are not aggressive enough to kill plant hosts. In this session, I gave a talk on bacterial canker of wild cherry. Although my talk did not generate a lot of discussion at the time, on the last day this disease was in the limelight again.

On the third day we had an excursion. After driving through the mountainous countryside north of Sapri, we visited an organic

buffalo farm situated in the Campania plains. We had a tour of the farm: from the calves and the milking cows to mozzarella making. We had the opportunity of tasting cheese, yoghurts and fantastic ice creams made with buffalo milk. After a picnic lunch on the lawn we went to Pompeii, one of the most important archaeological sites in the world. We arrived back at the hotel very happy and quite tired, but the day was still not over. After dinner there was a football match between the hotel staff and conference participants. The hotel staff side dominated the first half, but the conference surprisingly recovered in the second half to draw the game at 12-12. The Hotel side (deservedly) won after a number (I lost count) of penalties. I would like to highlight the independence of the referee, Matthias Ullrich, and the great skill of Andrew Pitman, David Jones, our youngest player, and John Mansfield our brave goalkeeper and the only 'conference' player that stayed on the pitch during the entire game - we can not blame him for losing on penalties!

The last day of the conference began with a session on molecular techniques for identification and detection. Charles Manceau, David Stead, Maria Lopez and Norm Schaad showed that molecular methods, in particular different types of PCR, can be successfully used for the detection of bacteria (*P. syringae*, *Ralstonia solanacearum* and Acidovorax). Arantxa Rico showed that primers directed to the phaseolotoxin gene cluster should not be used to detect *P. syringae* pv. *phaseolicola* because some strains do not produce this toxin. The last two sessions were on new emerging pathogens and taxonomy. David Stead reviewed the new and old plant pathogenic bacteria highlighting pathogens of increasing economic concern and Anne Willems reviewed the taxonomy of phytopathogenic ex-pseudomonads. The last talk by Laurent Sutra on a potential new *P. syringae* pathovar that causes bacterial canker of cherry generated heated discussion. Norm Schaad suggested that it would be more appropriate to include these strains in a new species, David Stead liked the idea of a new pathovar and I proposed that if they are only pathogenic on cherry, they should be included in *P. syringae* pv. *morsprunorum* regardless of differences observed in some tests and rep-PCR. By this time, we realised that our interpretations of a pathovar is not exactly the same. Do we need a new definition? The discussion on this topic continued during the farewell party and even during a swim after midnight with the moon illuminating the Mediterranean Sea.

I would like to finish by thanking BSPP for their financial contribution that enabled me to attend this conference.

Joana Vicente, *Horticulture Research International, Wellesbourne*.

View from the conference hotel to the bay and beach. Note the olive trees in the foreground, ubiquitous around Italy and the Mediterranean. Studies of the olive knot pathogen, Pseudomonas savastanoi pv. savastanoi, featured in many peoples research at the conference.

VIII International Fungal Biology Conference, Guanajuato, Mexico, December 2002

Setting. Around 200 scientists gathered from across the continents at the VIII International Fungal Biology Conference in Guanajuato, Mexico this past December. This beautiful colonial city lies nestled in a deep narrow gorge between arid mountains and is known as the Royal City of Mines. Its brightly coloured houses are closely-clustered between baroque palaces and churches. The atmosphere is youthful, boisterous and vibrant: full of students and actors and musicians keen to perform throughout the narrow winding streets of the town.

Science. The programme started with 2 special lectures, and was followed by 6 themed symposia, 5 workshops and poster sessions. The superb quality of so many talks makes it hard to pick out the real highlights and so this should be considered as a personal account. Regine Kahmann (Max-Planck) opened the proceedings with an excellent review of the usefulness of *Ustilago maydis* to research in molecular phytopathology and Salomon Bartnicki-Garcia (California and Cicese) reviewed his contribution to fungal growth (preceded by an amusing revue of his life, courtesy of Gordon Beakes, who, for his efforts was rewarded with a comb!). The first symposium, on Fungal Structure carried the most beautiful images of the fungal cytoskeleton as viewed by light and electron microscopy (Robbie Roberson, Arizona State), superb 2-photon and confocal images of GFP fused to various organelle promoters (Nick Read, Edinburgh, Fig 4) and an interesting talk on polarity by Michelle Momany (Georgia) (Fig 3). Next, came a workshop on secondary metabolism dominated, naturally, by tales from *Aspergillus* but ending with a nice review of the work by Paul Tudzynski s lab. (Muenster) on the ergot alkaloid pathway in *Claviceps purpurea*. Jose Ruiz Herrera (Irapuato) chaired the next symposium on Fungal Growth and Dif ferentiation in which we heard an interesting story on virulence in *Cryptococcus neoformans* from Jim Kronstad (British Colombia) and about some of the fascinating techniques used to assess the contribution of turgor pressure to fungal invasion of the host from Holger Deising (Halle). The following day Ralph Dean (North Carolina State) chaired the session on Signal T ransduction in which he stunned us with facts about the genome sequence of *Magnaporthe grisea*. Jesus Aguiree (Universidad Nacional Autonoma) gave an elegant talk about a member of the *Hog*1 stress MAPK family in *Aspergillus* and some exciting new data about the role of NADP-oxidase. Scott Gold (Georgia) talked about cAMP and MAP kinases in *Ustilago maydis* and I managed, by accident, to join together the themes of the previous talks by looking at signal transduction and combating host-imposed oxidative

Basilica of Our Lady

stress in *Blumeria graminis*. Thereafter, came a workshop in Biological Control and a symposium on Sexual and Asexual Development . Of the 1 1 talks 2 in particular caught my attention: Martha Merrow (Ludwig-Maxililians) talking about the *Neurospora* circadian clock and Lorna Casselton (Oxford) for the elegance of the genetics which underpins her group s work on genes that initiate sexual development in *Coprinus*. Next day, the workshops on Fungal Cell Wall Synthesis and Structure and Genomics were held on either side of the symposium on Yeast-like and Dimorphic Fungi . Highlights here were the talks from Neil Gow (Aberdeen) on *Candida* and from Judith Berman (Minnesota) comparing morphogenesis in yeast and *Candida*. So to the final day, where we heard about Fungus-host Interactions in the symposium and about Secretion and Extracellular Enzymes in the last workshop. Two talks caught my imagination here: from Gary Cole (Medical College of Ohio) about an immunodominant glycoprotein produced by the human respiratory pathogen *Coccidiodes* which may perturb the T-helper 1 and 2 host immune pathways and some exciting new data from Nick Talbot (Exeter) about the role of a particular Zn-metallothienin putatively involved in the oxidative cross-linking of the *Magnaporthe grisea* cell wall **.**

Social. Here our hosts excelled: We were invited to see a Folk Dance Ballet, to walk around the streets of the town serenaded by a troup of Mexican musicians, invited to sample Mescale and to attend the final conference dinner in the gardens of the Hacienda of San Gabriel Barrera (Fig. 4).

Summary

This was one of the best conferences I have attended; it was a stunning location, the speakers were prepared to divulge unpublished data, there was much enthusiasm, intermingling and exchange of ideas and here new national and international collaborations were forged.

I thank BSPP for its generous support.

Sarah Gurr, Oxford

Nick Read, Michelle Momany and Nick Talbot at conference dinner

3rd ASM and TIGR Conference on Microbial Genomes
New Orleans, USA, 29 January - 1 February 2003

I am involved in a collaboration between SCRI and the Sanger Institute, which has just completed sequencing the genome of *Erwinia carotovora* subsp *atroseptica* (*Eca*, which causes blackleg and soft rot on potato). So my attendance at the Microbial Genomes conference, part funded through BSPP, was very timely. The conference provided an ideal opportunity for us to present initial findings from the genome sequence, to speak with our collaborators (especially those involved in sequencing *Erwinia chrysanthemi* (*Ech*)), and to hear of post-genomic studies in other pathogens such as *Pseudomonas syringae* and *Xanthomonas* spp.

One very relevant body of work was a talk and several posters from Alan Collmer s group (Cornell, USA) and their collaborators who work on *P. syringae*. The genome of *P. syringae* pv. *tomato* DC3000 is complete (but unpublished) whilst that of *P. syringae* pv. *syringae* has been draft sequenced. *P. syringae* is a stealth pathogen that can grow asymptomatically in compatible host plants, and proteins translocated by the type III secretion system (TTSS or *hrp* system) into the host have a key role in pathogenesis. In incompatible reactions, some of these proteins betray the pathogen and initiate the host s hyper-sensitive response (HR). Thus, a major thrust of the *P. syringae* genomic research is to identify the full complement of *hrp*-secreted proteins. This involves a combination of bioinformatic mining of the genome data (*e.g.* to identify genes with possible *hrp* box promoter sequences), and microrarray / proteomic analysis of *hrp*-regulated transcripts / proteins. An elegant calmodulin reporter gene system is also being used to verify the presence of putative translocated proteins within the host cells. Virulence functions of *hrp*-secreted proteins are also being demonstrated by their ability to suppress an HR when produced by a strain of the non-pathogenic *P. fluorescens* carrying a functional TTSS. Alan also explained how *hrp*-secreted proteins are now thought to fall in to two classes: helpers (or accessory proteins) and effectors (TTSEs). Harpins (heat stable, glycine rich, cysteine lacking acid proteins, often secreted in relatively large amounts and causing HR in non-hosts) are now regarded as helper proteins that assist in the translocation of the true effector proteins into the host *via* the *hrp* pilus. In addition, although different helper and effector proteins may not superficially resemble one another in terms of their similarity by a BLAST search for example, there are often certain shared features that become apparent on closer inspection. This work is bearing fruit with the identification of a large number of *hrp*-regulated genes, some of which have been verified as harpins or effectors.

Nicole Perna, who heads the *Erwinia chrysanthemi* genome sequencing project, gave a brief update on progress: only a few gaps remain in the genome sequence and it should be finished shortly. It is very similar in size to the *Eca* genome but sequence divergence is reasonably high, with around 85% nucleotide identity. Systematic comparisons will be revealing. Meanwhile Ching Hong Yang and staff at UC Riverside are using various screens for novel pathogenicity determinants. In one study, GFP was used as a reporter in an IVET promoter trapping screen of a library of 10 000 cloned fragments of *Ech* DNA. In 61 of these clones genes upregulated *in planta* were identified. Mutants for some of these genes, including several *hrp* genes, were found to have reduced virulence *in planta*. In another study functional cloning , where a library of cloned sequences (with a GFP reporter), co-

transformed into *E. coli* along with a plasmid bearing the *hrp* gene cluster, was used to identify novel *hrp*-regulated genes. These new genes were then added to a training set to allow bioinformatic predictions of further candidate *hrp*-regulated genes from the genome sequence.

The Brazilian consortium that sequenced the first phytopathogen genome (*Xylella fastidiosa*) 3 years ago has now sequenced 3 different xanthomonad genomes. The sequences of *X. axopodis* pv. *citri* (*Xac*) and *X. campestris* pv. *campestris* (*Xcc*) were published last year, whilst that of *X. axopodis* pv. *aurantifolli* (*Xaa*) was completed recently. Analysis of the *Xac* and *Xcc* genomes has revealed many shared virulence factors that are almost identical (*e.g.* xanthan gum synthesis, Types I, II, III and IV secretion systems and adhesins), some shared factors that differ significantly (*e.g.* the complement of plant cell wall degrading enzymes) and some that are unique to one species or other (such as some TTSEs). These differences can be postulated to account for differences in pathogenesis *e.g.* the smaller number of plant cell degrading enzymes in *Xac* probably accounts for its limited lesions, whilst more putative TTSEs in *Xcc* may partially account for its ability to infect systemically, as might nitrate assimilation genes (since the xylem is a nitrogen-poor habitat). In *Xaa* high throughput *in planta* screens of both random and directed mutants is being used to investigate candidate pathogenicity genes. Furthermore, two additional strains of *Xaa* are almost completely sequenced. The three *Xaa* strains show variations in host specificity on different citrus fruit and it is hoped that comparative genomics will reveal the molecular bases for this.

Away from phytopathogens, but staying with a theme of how examining gene content in related species can account for variation in pathogenicity, Julian Parkhill of the Sanger Institute compared the genomes of three *Bordetella* species: *pertusis*, *parapertusis* and *bronchoseptica*. *B. pertusis* and *parapertusis* are host specific pathogens whereas *B. bronchiseptica* is a generalist. The specialists have lost many more small molecule uptake genes relative to the others, which fits with the idea of niche specialisation. Also *B. pertusis* has a large number of pseudogenes: this fits with observations of decay of genes into pseudogenes being associated (cause or effect?) with host-specialisation as seen in other pathogens *e.g. Salmonella typhi*. This finding also illustrates the value of a complete genome sequence as fragmentary genomic information, *e.g.* from draft shotgun sequencing, might miss pseudogenes. Another surprising finding was that in *B. parapertusis*, the pertusis toxin gene has decayed into a pseudogene whereas in *B. bronchispetica* the toxin gene is intact. The suggestion is that in *B. pertusis* expression of the toxin gene has become de-regulated, thus causing it to be far more pathogenic. This creates a problem for the pathogen, *i.e.* killing of the host, but the symptoms of the whooping cough provide a transmission mechanism to a new host. Thus, the idea that simple acquisition and loss of key genes will account for all variations in pathogenic phenotype is rather simplistic. More subtle effects on regulation need to be considered also.

I thank BSPP for providing funds to enable me to attend this conference.

Kenneth Bell

International *Fusarium* Workshop, Sydney 2003.

Seminars about *Fusarium* are always interesting to me, but no time more so than in somewhere like sydney! The weather was beautiful and everyone attending the conference was in good spirits. The first part of the conference focused on *Fusarium* taxonomy and what constitutes a

species. Should point mutations in several genes such as beta-tubulin constitute a species distinction, and if so how many species will we end up with in a sexually reproducing homothallic species such as *Fusarium graminearum*? Kerry O Donnell (USA) and others discussed lineages within *F. graminearum*. It is now established that there are at least nine lineages of this pathogen, with lineage seven being most predominant in the USA. The study of *Fusarium* karyotypes is notoriously difficult and Cees Waalwijk (the Netherlands) presented a technique call the germ tube burst method and stated that is serves as a useful tool supplementary to pulse field gel electrophoresis and linkage mapping for genetic studies of various *Fusarium* species.

We heard many talks on *Fusarium* head blight of wheat (FHB). Jeannie Gilbert (Canada) gave an interesting talk on the effect of field stubble on FHB disease development. Australia provides a multitude of economically important hosts for *Fusaria*, such as bananas, cotton AND cereals. Panama disease of banana caused by *F. oxysporum* F. sp. c*ubense* is regarded as one of the most destructive plant diseases of recent times, and Suzy Bentley (Australia) discussed the geographical distribution of lineages of this pathogen and the potential of using resistant germplasm for controlling disease spread.

Overall, the conference was very enjoyable, and highlighted the fact that *Fusarium* is a very topical disease worldwide and as such that there is a vast amount of research ongoing on this pathogen. As eluded to by John Leslie (USA) in the closing address, the sequencing of the *F. graminearum* genome will futher strengthen the position of *Fusarium* as a model organism. Therefore the 10th International *Fusarium* workshop will undoubtedly see *Fusarium* research advanced by leaps and bounds!

Fiona Doohan,
Faculty of Agriculture,
Dublin, Ireland.

Fungal Genetics Conference XXII
Asilomar, California, US: 18-23 March 2003.

Now there are times when being a PhD student working on an obligate biotroph is not the most enviable of occupations, where the thought of a happy Petri dish full of fungus is but a distant dream. However, whilst cycling the 17-mile coastal drive on the beautiful Monterey peninsular, through the quiet and colourful Pacific Grove and past the glorious dunes and rocks of Asilomar State Beach, I felt that perhaps finally things were coming together in a most satisfactory way. Happily, the scenery was just the first of the attractions that Asilomar had waiting for me.

The 22nd fungal genetics conference was a first-rate combination of a good number of talks highly relevant to my project, and presentations that confronted me with subjects my past experience had hardly touched upon. This was exemplified by the first day of talks where the morning plenary session explored cell biology, including an interesting look at nuclear migration using beautiful time-lapse images of *Aspergillus nidulans* from Reinhard Fischer. Nuclei migrate towards growing tips of hyphae in a complicated way, and his group has found that a kinesin contributes to the accumulation of the motor dynein at the hyphal tip and thus influences the migration process. Subsequently the afternoon workshop on fungal stress responses was of great interest, being of direct relevance to my work and allowing me to at last put faces

to names on papers. Here Wilhelm Hansberg presented results from analysis of catalase mutants in *Neurospora crassa* to support the idea that microbial cell differentiation is a response to a hyperoxidant state. Then Paul Tudzynski turned the attention to plant pathogens to ask if fungal reactive oxygen scavenging systems are essential for pathogenesis. He used the two very different examples of *Botrytis cinerea* and *Claviceps purpurea* to illustrate two different strategies of pathogens encountering an oxidative burst from the host plant. Firstly, necrotrophic *Botrytis* appears to contribute to the burst, and its pathogenicity is affected by removal of an active oxygen species-generating system. Conversely he put forward evidence that the biotroph *Claviceps* attempts to combat an oxidative burst from rye by secreting AOS-scavenging enzymes.

The plenary session of the second day of talks was dedicated to fungal-host interactions and a number of interesting areas of research were presented. Marc-Henri Lebrun discussed the possibility of infection-specific regulatory networks in *Magnaporthe grisea* and other fungal species. Regine Kahmann spoke about exploiting the annotation of the *Ustilago maydis* genomic sequence using micro array analysis.

Another useful part of the conference was report of emerging new techniques and resources. A number of posters presented work on gene silencing, with Pierre de Wit s group giving evidence of the usefulness of the technique in determination of virulence functions in *Cladosporium fulvum* and Jin-Rong Xu s group demonstrating success in *Magnaporthe*. A whole concurrent session was dedicated to genomics, including a report from the Whitehead institute. The theme was continued by Gillian Turgeon in the final morning s session, speaking about comparative genomics of plant pathogenic fungi made possible by the complete genome sequences now accessible. She and co-workers have used both phylogenomic and functional strategies to compare gene families involved in primary and secondary metabolism in fungi with differing pathogenic lifestyles. Their work on histidine kinases suggests groupings of genes into those required for basic functions common to all ascomycetes, whether pathogenic or not, and others which may be attuned to particular pathogenic niches.

The final evening gave us Hans Van Etten s entertainingly sick view of fungi and his apparently infamous hat that was well worn on the dance floor into the early hours. I am very grateful to the BSPP for making my attendance at this conference possible. The contingent from my lab wasn t huge but meant that I spoke to more new people at each meal and poster session and came away feeling that I had interacted successfully with the international fungal community.

C. Henderson

BSPP TREASURER

The BSPP Board wishes to appoint a successor to our current Treasurer, Dr Simon Archer, who has provided sterling service to the Society during his term of office.

You can find out more about what this important and interesting role entails by contacting Simon directly (details below). Expenses for administrative support will be provided.

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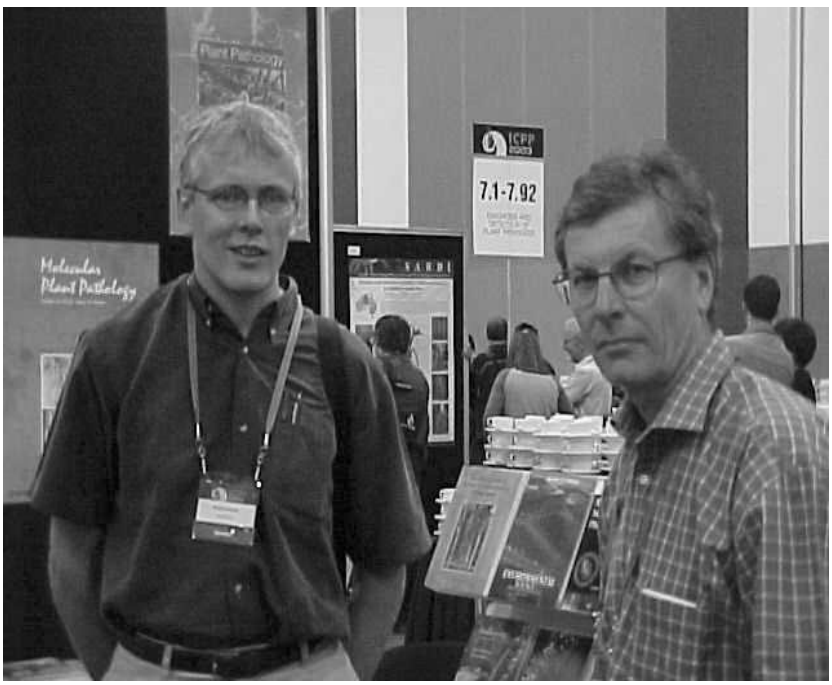
NEXT ISSUE

A Week in the Life - Fen Beed takes delivery of his new company car



The great and the good try to convince us it was work - reports from ICPP Aukland

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