



Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra

Federal Department of Economic Affairs DEA

Agroscope Changins-Wädenswil Research Station ACW

Five Years of COST Action 853

A Review

Juerg E. Frey and Frédérique Pasquer

Final COST 853 Meeting, Sant Feliu de Guixols, Spain,
22.05.2007



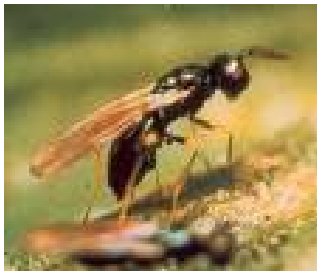
COST Action 853

Agricultural Biomarkers for Array Technology

CSO approval date	08/06/2001
Entry into force	31/10/2001
End date	06/03/2007



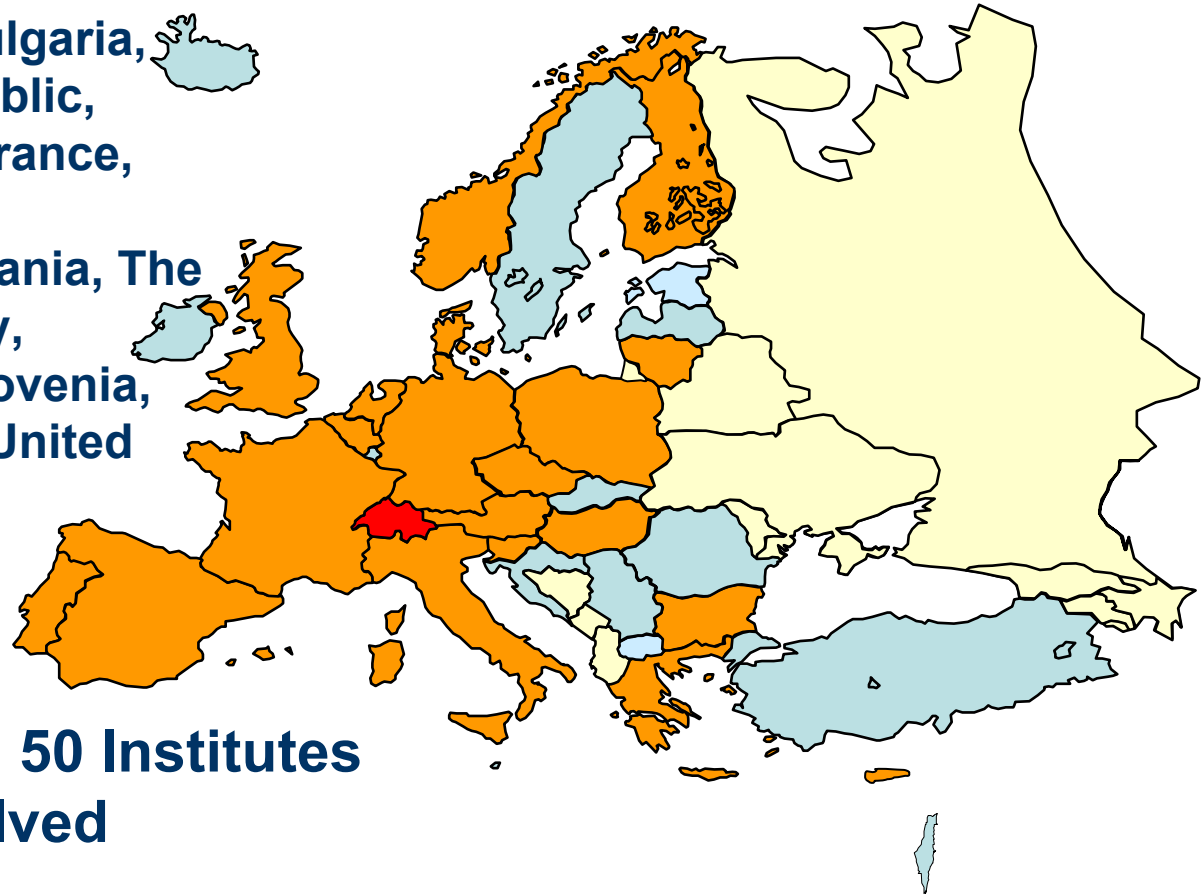
Identification of plant pathogens and genes relevant for crop production





- **21 country members :**

Austria, Belgium, Bulgaria, Cyprus, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Italy, Lithuania, The Netherlands, Norway, Poland, Portugal, Slovenia, Spain, Switzerland, United Kingdom



- **More than 50 Institutes involved**

Economic Dimension: 20 Million €

Duration: 5 years



Cost 853 Organization

- **Chair of the Action: Dr. Jürg E. Frey**

Agroscope FAW Wädenswil,
CH-8820 Wädenswil, Switzerland
juerg.frey@acw.admin.ch



- **Vice-Chair of the Action: Prof. Günter Adam**

Institut für Angewandte Botanik, Universität Hamburg
Hamburg, Germany
guenter.adam@iangbot.uni-hamburg.de



- **Rapporteur: Dr. Marianna Schauzu**

Federal Institute of Risk Assessment
Berlin, Germany
marianna.schauzu@bfr.bund.de



- **Secretary Officer: Prof. John Williams**

COST office
Brussels, Belgium
jwilliams@cost.esf.org





Objectives

“...to establish and support microarray technology as a new tool for

breeding

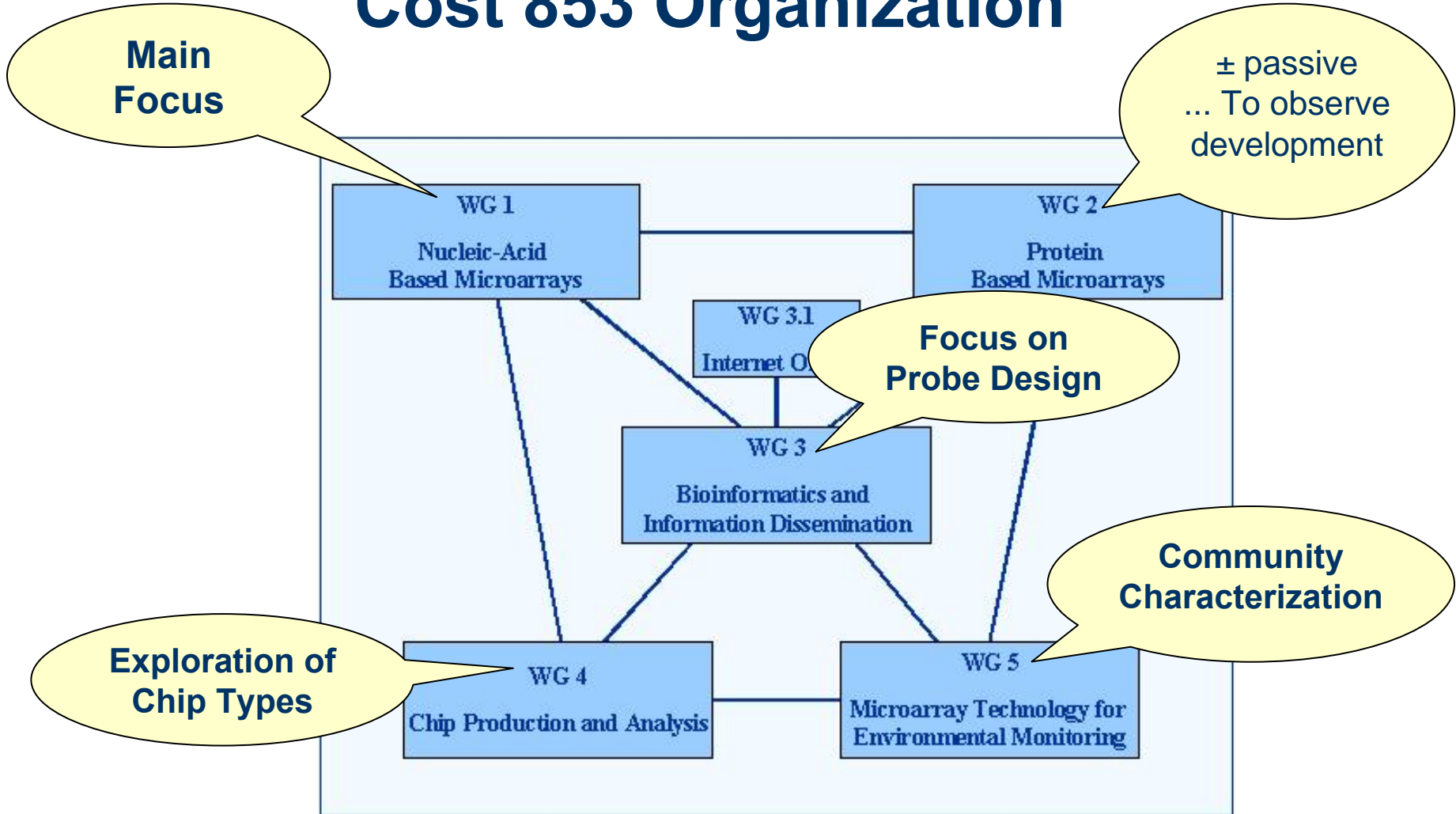
diagnosis

high throughput screening

in the field of agriculture...”



Cost 853 Organization





Cost 853 Organization

- **Working group 1:** *Nucleic-Acid Based Microarrays*

Group leader: Peter Bonants

Plant Research International, NL

Viral, Prokaryotic, Eukaryotic phytodiagnostics



- **Working group 2:** *Protein Based Microarrays*

Group leader: Neil Boonham (I. Barker)

Central Science Laboratory, UK

Protein markers for phytodiagnostics



- **Working group 3:** *Bioinformatics and Information Dissemination*

Group leader: Ulrich Wagner (P. VonRohr)

Functional Genomics Center Zürich, CH

Potential probe search, probe design, microarray data analysis



- ***Internet home-page***

Frédérique Pasquer (Moni Pfunder)



Cost 853 Organization

- **Working group 4: *Chip Production and Analysis***

Group leader: Dietmar Blohm

University of Bremen, DE

Spotting, short oligonucleotide synthesis



- **Working group 5: *MA Technology for Environmental Monitoring***

Group leader: Xavier Nesme

University Claude Bernard Lyon, FR

Meta-genome fingerprinting, marker function, bio-marker expression





Action website on-line: www.COST853.ch

COST
Action 853

Home
Objectives
Working Organization
Working Groups
Meetings
Publications
Short-Term Scientific Missions
Management Committee Members
Participating Scientists
Links
COST home page in Brussels
Jobs
Contents by:
Jürg E. Frey
Frédérique Pasquer
Agroscope Changins-Wädenswil
Last update: 10.01.2007

Final COST853 Meeting held in Spain, on May 22-23, 2007

Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra

Station de recherche
Agroscope Changins-Wädenswil ACW

COST ACTION 853

ACW Agroscope Changins-Wädenswil
Swiss Federal Research Station for Horticulture

Agricultural Biomarkers for Array Technology

Reference	COST 308/01	
Period of validity	31/10/2001 – 06/03/2007	
21 Signatory countries	AT, BE, BG, CH, CY, CZ, DE, DK, ES, FI, FR, GR, HU, IT, LT, NL, NO, PL, PT, SI, UK	
Chairperson	Vice-chairperson	Scientific Secretary
Jürg E. Frey Agroscope FAW Wädenswil Swiss Federal Research Station for Horticulture Department of Plant Protection Laboratory for Molecular Diagnostics CH-8820 Wädenswil Switzerland Tel: +41 1 783 6332 Fax: +41 1 783 6434 http://www.acw.admin.ch/ juerq.frey@acw.admin.ch	Günter Adam Institut fuer Angewandte Botanik Fachbereich Biologie Universität Hamburg Ohnhorststr. 18 D-22609 Hamburg BRD Germany Tel: +49 40 42816 562 Fax: +49 40 42816 555 http://www.biologie.uni-hamburg.de/lanb/ quenter.adam@iangbot.uni-hamburg.de	John Williams COST office 147 avenue Louise B - 1050 Brussels Belgium Tel: +32 2 533 38 26 Fax: +32 2 533 38 90 http://cost.cordis.lu/src/home.cfm jwilliams@cost.esf.org



Working group meetings 2002-2003

- **March 7 – 8, 2002, Brussels, Belgium**
1st Management Committee Meeting

Overall organization



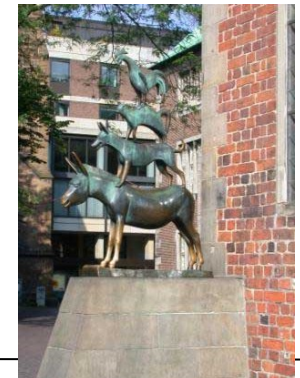
- **September 26–28, 2002, Waedenswil, Switzerland**
Combined Meeting of Working Groups 1 and 3
and 2nd Management Committee Meeting

First research reports; status established



- **September 24–26, 2003, Bremen, Germany :**
Meeting of Working Group 4
and 3rd Management Committee Meeting

Focus on microarray production





Working group meetings 2004

- **August 16–17, 2004, Helsinki, Finland:**
Meeting of Working Group 1 and
4th Management Committee Meeting

- Multiplex detection
- Exploration of application range
- Electrochemical detection
- Padlock probes



- **June 24-25, 2004, Ascona, Switzerland :**
Combined Meeting of Working Groups 3, 4 and 5

- First encounter with ARB
- Efforts of WG5 towards 16S-based environmental monitoring chip





Working group meetings 2004

■ June 24-25, 2004, Ascona, Switzerland : Combined Meeting of Working Groups 3, 4 and 5

- First encounter with ARB
- Efforts of WG5 towards 16S-based environmental monitoring chip



■ August 16–17, 2004, Helsinki, Finland: Meeting of Working Group 1 and 4th Management Committee Meeting

- Multiplex detection
- Exploration of application range
- Electrochemical detection
- Padlock probes





Working group meetings 2005

- **June 20-21, 2005, Gdansk, Poland:**
Combined Meeting of Working Groups 1 and 2
5th Management Committee Meeting



- Use in pathogen – plant interactions (regulation)
- ring testing results
- Arrayed qPCR, protein arrays, first Luminex contact

- **November 29-30, 2005, Lyon, France :**
Combined Meeting of Working Groups 4 and 5



- **WG4:** Update on DNA chip technology
- **WG5:** Genome diversity, meta-genome fingerprinting, biomarker expression



Working group meetings 2006

- **June 19-20, 2006, Wageningen, The Netherlands:**
Combined Meeting of Working Groups 1 and 2
and 6th Management Committee Meeting



- Successful use of diagnostic microarrays in medicine
- PRI-lock probes, electric biosensor arrays
- CGH on Agrobacterium tiling arrays

- **September 18-19, 2006, Zürich, Switzerland :**
Working Group 3: Bioinformatics and Information
Technology



- Gene expression microarray data analysis
- Probe design, data analysis and data management for diagnostic microarrays

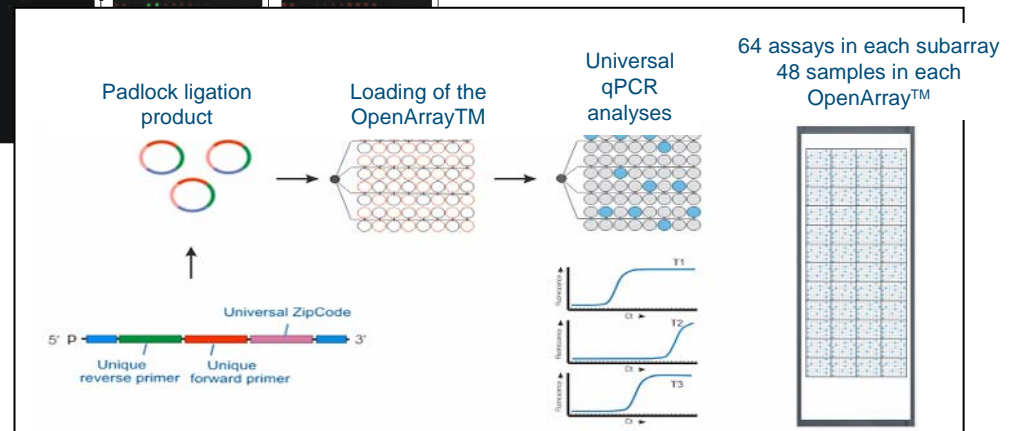
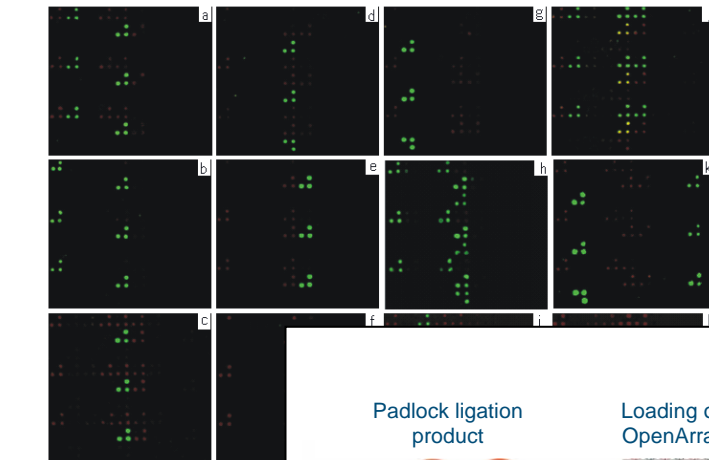
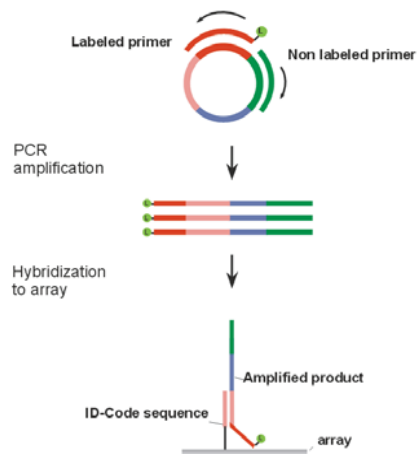


Results Working Group 1

- Quantitative multiplex detection of plant pathogens using PRI-lock probes
R van Doorn, P Bonants and C Schoen



Multiplex target detection or genotyping





Results Working Group 1

- Development and evaluation of *gyrB* DNA microarray for detection of and identification of pathogenic bacteria

T. Kostić, A. Weilharter, S. Rubino, G. Delogu, K. Rudi, A. Sessitsch and L. Bodrossy



ARC Seibersdorf research GmbH, Austria

→ SSELO: Sequence-Specific End-Labeling of Oligonucleotides

	short oligo MDMs (15-30 mer)	long oligo MDMs (50 – 70 mer)	SSELO MDMs
(sequence) specificity	high 1 bp discrimination	low 85 - 90% seq. homology	high 1 bp discrimination
taxonomic resolution potential	species - strains	genus – species*	species - strains
sensitivity (rel. abundance)	„low“ ~ 5 %	high ~ 1%	high ~ 0.1%

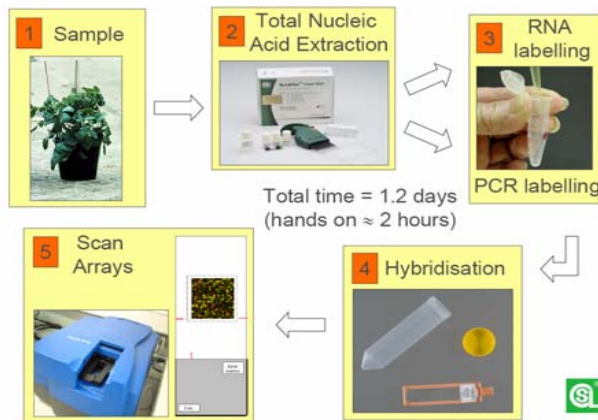


Results Working Group 1

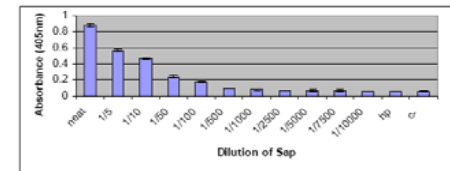
▪ Detecting viruses using microarrays

Boonham N

Central Science Laboratory

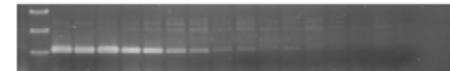


ELISA



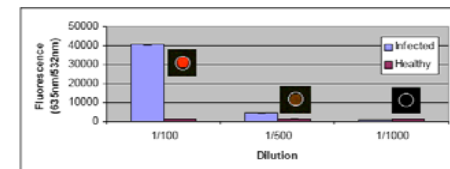
1/100

PCR



1/5000

Array



1/500

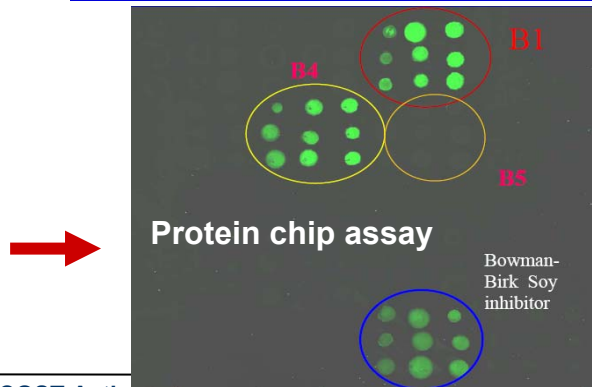
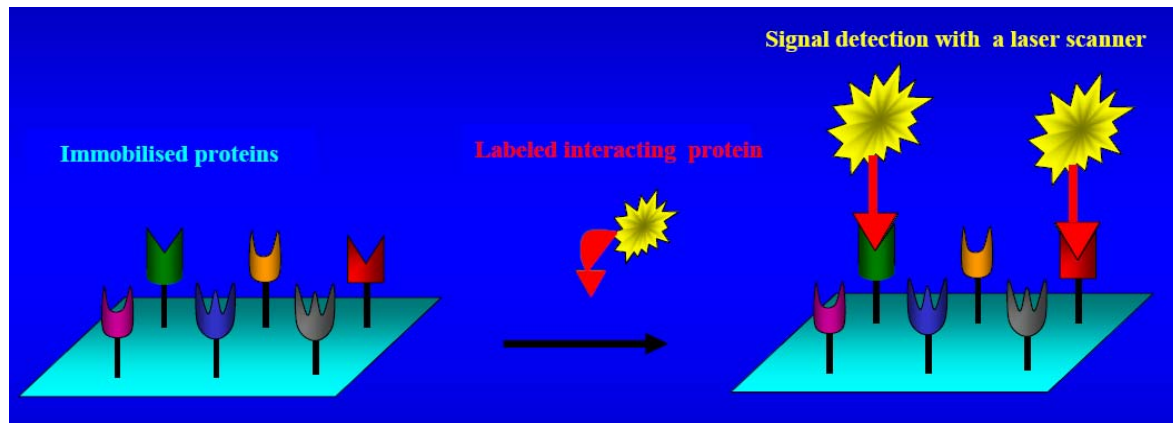
➔ **Transfer of technique to non-expert labs: need of thorough training to maintain the technique sensitivity**



Results Working Group 2

- Protein chips for screening of protease inhibitor protease interactions.

Cimaglia F, D'Urso FO, Shevelev A, Santino A, Poltronieri P



In vitro assay

PKPI -	A1	A2	B1	B2	B3	B4	B5
TRIPSENA	+	+	+	+	+	+	+
CHIMOTRIPSENA	-	-	+	-	-	-	+
Cathepsin B	+	+					+
PAPAINA	-	-	-	-	-	-	-
ELASTASI	-	-	-	-	-	-	-

- Binding of proteinase to specific inhibitors

- Confirmation with *in vitro* assay

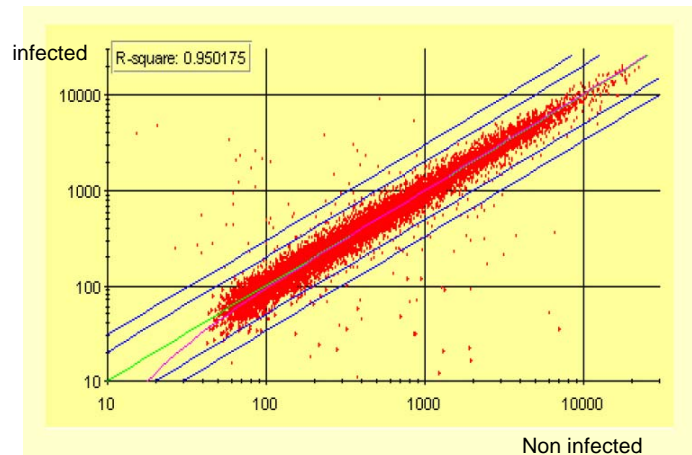


Results Working Group 3

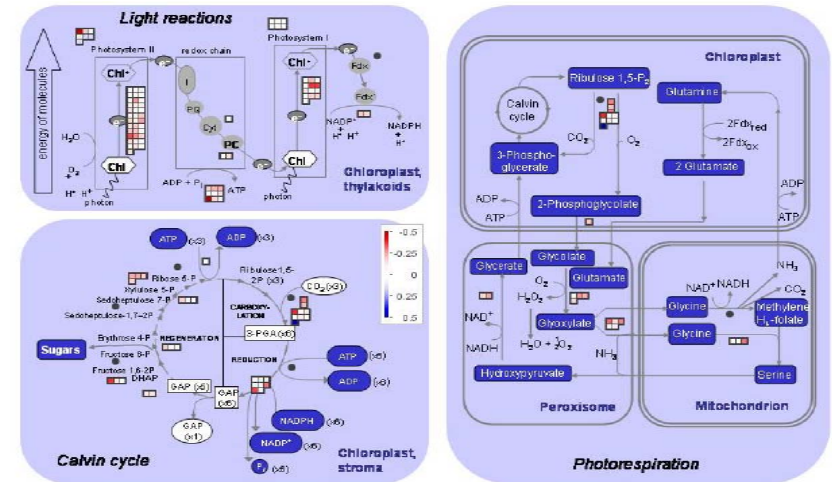
• Nucleic acid microarray data analyses in potato–virus interaction studies

M Pompe-Novak, Š Baebler, H Krečič-Stres, K Gruden, M Kovač, M Jongsma, M Ravnikar

National Institute of Biology, Ljubljana, Slovenia



Determination of differentially expressed genes after virus infection



Determination of pathway:

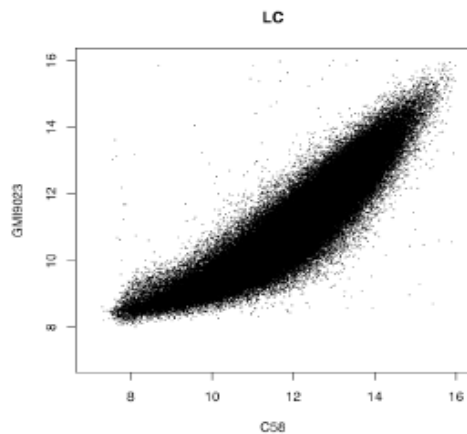
- involved in resistance against virus
- triggered by virus infection



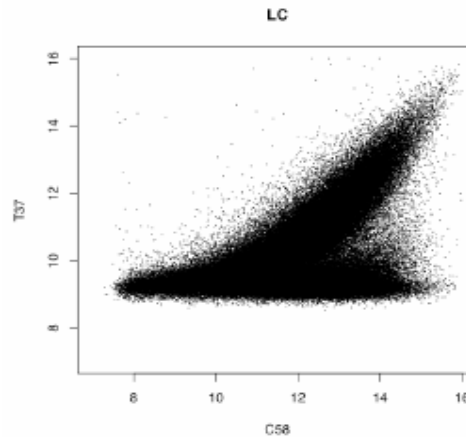
Results Working Group 5

- Early results of CGH on Agrobacterium tiling arrays: the lessons from a short oligo design.

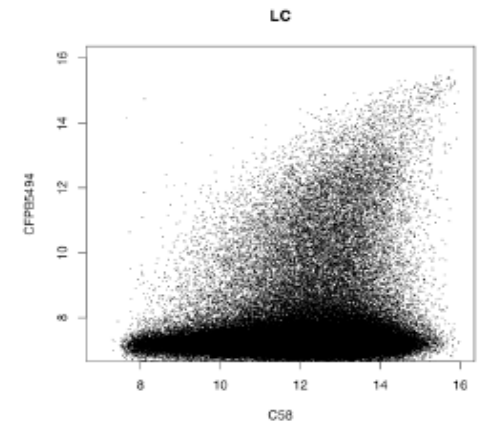
Oger-Desfeux C, Costechareyre D, Chapulliot D, Lobry J, Daubin V and Nesme X



Homologous strains



Same genomic species



Same biovars



Short Term Scientific Mission Workshop 2004

- July 26-30, 2004, Bremen, Germany
1st STSM Workshop in Array-Technology:

Microarray practice in the laboratory :

From spotting of the probes to analysis of the hybridisation results





Short Term Scientific Mission Workshop 2004

- **September 25-29, 2004, York, United Kingdom**
2nd STSM Workshop in Array-Technology:
Detecting plant viruses using microarrays:
- **Hands on experience on microarrays**
- **Comparison with other detection systems**



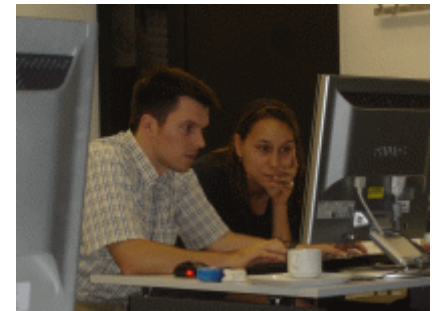
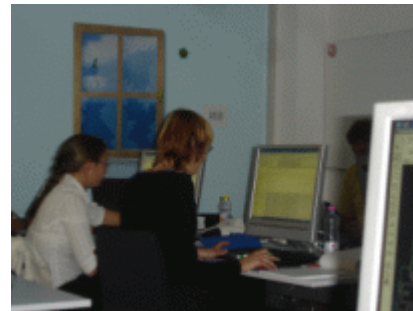
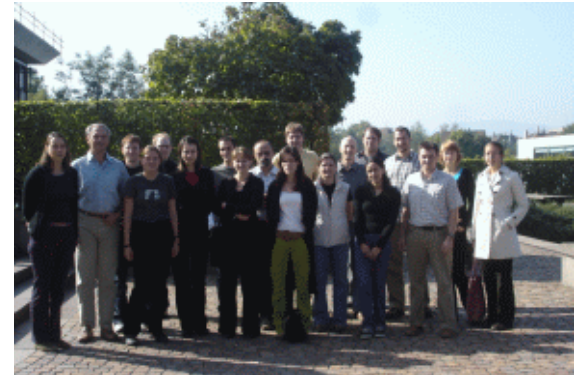


Short Term Scientific Mission Workshop 2006

- September 20-22, 2006, Zürich: STSM:
ARB: Probe Design and Phylogenetic Aspects

Young scientist training on:

- Phylogenetic tree reconstruction
- *In silico* probe design
- Handling of the software package ARB





Links to European Organizations:

- **COST Actions 873, B28, 864, 861, 858, 926**
- **ESF-Eurodiversity METHECO** The role of microbial diversity in the dynamics and stability of global methane consumption: microbial methane oxidation as a model system for microbial ecology
- **6FP- EU-Project “Nano-biotechnical components of an advanced bioanalytical microarray system (GenSensor-Nanoparts)”**
- **6FP- EU-Project “Towards DNA chip technology as a standard analytical tool for the identification of marine organisms (fish&chips)”**
- **6FP- EU-Project “Electrical Bio Sensor Arrays for Analyses of Harmful Micro Organisms and Microbial Toxins“**
- **EPPO (European Plant Protection Organization)**
- **ECPGR (European Cooperative Programme for Plant Genetic Resources)**



Technical cooperations - transfer of technologies to companies





COST Action 853: Main successes

- **Short Term Scientific Mission **Workshops** within COST**
 - Workshops in Bremen (2004), York (2004), Zürich (2006)
 - Individual missions in European laboratories
 - **More than 200 papers published in peer-reviewed journals over the 5-year period**
 - **Development of sensitive diagnostic systems for detection of:**
 - viral, bacterial, fungal pathogens and arthropod pests
 - genes involved in breeding (cherry self-incompatibility)
 - **Elaboration of microarray chip for gene expression studies:**
 - e.g., cDNA microarrays for potato and codling moth
 - **Development of methods for robust diagnostics:**
 - Use of a) hierarchical and b) redundant probe design
- Improvement of European phytodiagnosis systems**



Drawbacks

- **Delay in data release/ dissemination of results when private companies are involved in technology development**
 - > **database still under development (P. Bonants)**
- **Harmonization of chip production hampered by spotting machine specificities (different spotters in different laboratories)**
 - > **but access is enabled for all technologies**
- **Several group-specific chips instead of ``unique`` chip containing all probes**
 - > **but more consensus on diagnostic genes / fragments**



COST Action 853: Main promises

“The benefits which can be expected from the Action can be summarized as follows:”

- ✓ • **Assessment of the suitability of different microarray techniques to the field of phytodiagnostics and animal/plant breeding**
- ∅ • **Establishment of a database containing all relevant information on nucleic acid sequences and proteins suitable for microarray - based phytodiagnosis**
- ✓ • **Co-ordination of microarray chip composition and production, profiting from the combined knowledge of all participating countries**
- ✓ • **Co-ordination of implementation of specific microarray technologies in participating countries, thereby establishing this important new technology in European phytodiagnosis**
- ✓ • **Significant improvement in harmonization of European phytodiagnosis**
- ✓ • **Support of this new phytodiagnostic technique on a broad European level**



Outlook/ Future Plans

- **We collect of all important achievements of the five different working groups within the COST Action 853, based on:**
 - **Progress reports**
 - **Oral presentations / posters**
 - **Publications**
- **We prepare a booklet describing these accomplishments (topics and tasks to be determined at the MCM)**
- **Major achievements of the COST Action 853 will be presented by P. Bonants at the 9th International Congress of Plant Pathology in Torino (ICPP 2008)**
- **The COST 853 homepage will continue to exist in some form and we continue our efforts to build the probe database**



Thank you very much indeed

- **Günter Adam (Vice-Chair)**
- **Peter Bonants (Leader WG1)**
- **Neil Boonham and Ian Barker (Leaders WG2)**
- **Uli Wagner and Peter von Rohr (Leaders WG3)**
- **Dietmar Blohm (Leader WG4)**
- **Xavier Nesme (Leader WG5)**

- **John Williams and Bouktje Stol (Scientific Officers)**
- **Christophe Peeters and all COST secretarial staff**

- **Frédérique Pasquer, Moni Pfunder and FreyLab Crowd (Homepage and much background support – really MUCH!)**