

number 7

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● **iss activities**

There have been no meetings to report since the last Newsletter but there has been much activity in connection with the next big ISSS meeting, in Brisbane, May 2005. Steve Adkins and the team have been very busy and arrangements are now well in hand. You should all have received the recent (November) programme and registration form. Please attend to these as soon as possible and get your colleagues to register for the meeting (see below).

If you have ideas for an ISSS meeting pass them to the President and the Secretary. Remember that the society gives financial support for its officially sponsored or supported meetings.

Our Secretary, Karen Koster, has just sent out a reminder for subscription renewal. Please do this soon and **get your seed colleagues to join our society**. There are plenty of seed scientists out there who still do not belong to the ISSS so please encourage them to sign up.

● **election and officers**

The ISSS officers are:

President, Ralph Obendorf (rlo1@cornell.edu)

President-Elect, Derek Bewley (dbewley@uoguelph.ca)

Secretary, Karen Koster (kkoster@usd.edu)

Treasurer, Ken Thompson (ken.thompson@sheffield.ac.uk)

Contact them if you have any queries or suggestions.

Derek Bewley assumes the Presidency in May, 2005, so we will need to elect a new President-elect. The President-elect serves a three-year term and then assumes the office of President. Two additional, 'ordinary,' positions on the executive committee are also slated for election in May 2005. The call for nominations will go out soon, but in the meantime think about possible candidates.

● ISSS member honoured

We are delighted to report that **Pat Berjak**, of the University of KwaZulu-Natal, Durban, South Africa, was recently honoured by the South African Department of Science and Technology when they bestowed the Distinguished Woman Scientist Award upon her.

Pat has worked in seed science for many years. Her Ph.D. concerned aspects of ageing in maize seeds, and this was followed by studies into the influence of fungal contaminants on loss of viability of stored seed. Perhaps she is best known for her work on recalcitrant seeds. These seeds are desiccation-sensitive and are, to all intents and purposes, unstorable, placing constraints on trade, but more importantly, on the potential for their long-term conservation.

Pat has established a world-leading group that considers both the fundamental aspect of understanding the biology of recalcitrant seeds - the 'why?' questions - as well as the applied aspect of attempting to develop methods for the short-term storage and long-term conservation of this material. At the time that she started working in the field, the knowledge of recalcitrant seeds was fragmentary and often conflicting. Together with her students, she has elucidated the processes underlying the biology of recalcitrant seeds, including the importance of, and seed response to, fungal and other microbial contamination. She has also pioneered the approaches to the cryopreservation of these seeds that are not empirical, but based on a sound understanding of the biology of the seeds and freezing and thawing processes.

Pat has mentored and trained a legion of students, many of whom now hold senior academic positions themselves. The regard her students have for her is attested to by the fact that the nomination of Pat for this honour was at the instigation of her current students.

Congratulations, Pat, from all your colleagues in the ISSS!

● news and meetings around the world

European co-operation

International Research Network “ Physiological and practical aspects of yield and seed quality improvement by ecological methods”.

The International Research Network, *Physiological and practical aspects of yield and seed quality improvement by ecological methods*, was created earlier this year by the Ministry of Science in Poland. This network gathers together six research teams from Poland and three foreign - from France, The Netherlands and Ireland. These teams are already working on seed quality improvement (ecological aspects) and the task of this Network is to promote cooperation and awareness of the research done by the participants. Every member of the Network conducts his research under his own budget but the Ministry of Science expects that through its

financial support for meetings there will be cross-fertilization of ideas, encouraging cooperation and the creation of a collaborative project.

At present, nine research groups, representing eight Institutes or Universities participate in the Network:

1. Research Institute of Pomology and Floriculture, Skierniewice (Prof. M. Grzesik, Dr. K. Górnik, Dr. A. M. Karsznicka, Dr. R. Janas, M.Sc. B. Badek, M.Sc. E. Chojnowska, Eng. B. Mika, M.Sc. D. Kleczko)
2. Warsaw Agriculture University (Prof. S. Podlaski, Dr. R. Bogatek-Leszczynska, Dr. S. Pietkiewicz, Dr. C. Krysiak, Dr. M. Hazem Kalaji, Dr. Agnieszka Gniazdowska-Piekarska, Dr. D. Chołuj, Dr. M. Rochalska, Dr. R. Karwowska, Dr. A. Dzierżyńska, Dr. A. Orzeszko-Rywka)
3. University of Warmia and Mazury in Olsztyn, Chair of Plant Physiology and Biotechnology (Prof. R. J. Górecki, Dr. K. Głowacka, Dr. A. I. Piotrowicz-Cieślak, Dr. L. B. Lahuta, Dr. D. J. Michalczyk)
4. University of Warmia and Mazury in Olsztyn, Chair of Biochemistry (Prof. S. Weidner, Dr. E. Frączek, M.Sc. S. Krupińska, M.Sc. W. Brosowska)
5. University of Lodz (Dr. Z. Romanowska-Duda, Dr. I. Wagner-Łotkowska, A. Małecka, A. Wolska)
6. University of Technology and Agriculture (Prof. E. Śliwińska, Dr. I. Jędrzejczyk, M.Sc. E. Łukaszewska, M.Sc. J. Sadowski)
7. University of Paris VI (Prof. D. Côme, Prof. F. Corbineau, Prof. C. Bailly, Prof. J. Leymarie, A. Lehner)
8. TNO Leiden (Dr. B. van Duijn)
9. University of Cork (Prof. P. Jones, Dr. K. Devine, M. Barrett, E. Millerick, M. Reza Siahpoosh)

The first meeting was held on 17 June 2004 in Warsaw at the Plant Physiology Department of Warsaw Agricultural University. The subject of the meeting was the research activity of the Network participants. The next meeting will be on 4 February 2005, the topic of the meeting being "Markers of seed quality".

Poland

Fourth EESNET Meeting

The fourth EESNET Meeting was held in Poznań, Poland, on 14-16 November 2004 organized by the Polish Seed Trade Association with Crompton and Syngenta as the main sponsors. The topic of the meeting was "The European Seed Industry". There were about 250 participants from 25 countries, mostly representing seed and breeding companies and organizations from Central and Eastern Europe associated in EESNET, whose members share the aim of building a regional seed trade cooperation and a healthy seed market. To further this aim, EESNET since 1998 has organized Annual Meetings, formerly as Eastern European Seed Trade Meetings.

The subjects of the European Seed Industry Conference were: European Seed Market, Protection of Intellectual Property in Plant Breeding, Control of the Seed Market, How to Make Strategic Decisions in a Modern Corporation, Main Seed Systems in the World, How to Maintain the Highest Seed Quality, Seed Dressing in Europe, Polish Seed Industry, Seed Industry in the Russian Federation. Topics were presented by: Dr Francois Burgaud, GNIS; President Burt Kiewiet, CPVO; Dr.

Joachim Winter, ESA; Dr Mariola Kopcinski, DuPont Corporation; Dr Bernard Le Buanec, ISF, Dr David Jackson, Crompton Europe B.V., Dr Łukasz Wawrzyniak, Syngenta Crop Protection, Ltd; Dr Karol Marciniak, Danko Plant Breeding; Dr Vladislav Koroshkin, ESU Corporation.

The last day was devoted to trade meetings.

Australia

Highlights of the 5th Australian Workshop on Native Seed Biology, 21-23 June 2004, Brisbane, Queensland

In June 2004 the Australian Centre for Minerals, Extension and Research (ACMER) ran the 5th Australian Workshop on Native Seed Biology in Brisbane. Held over three days, the meeting had four main themes viz. Seed Production, Quality and Storage, Seed Ecology, Establishment and Management, and Dormancy and Germination. Approximately 120 people from around Australia attended with international visitors from the Millennium Seed Bank Project, Royal Botanical Gardens, Kew, UK. The Proceedings will be available from Ron McLean, ACMER Technology Transfer Manager, (PO Box 883, Kenmore Qld 4069, Tel: 61 7 3327 4556, Fax: 61 7 3327 4574, Email: R.McLean@acmer.com.au, web: www.acmer.com.au) in early 2005. The following is a brief summary of each of the four main themes presented at the Workshop.

Seed Production, Quality and Storage Issues

Genetic studies highlighted a number of issues relating to seed collections for revegetation from small fragmented remnant vegetation sites (Young, Coates *et al.*). It was proposed that there might need to be a tradeoff between local adaptation and seed quality. In the case of relatively small population (<100 plants), it might better to bulk seed from a number of small populations within the local area to maximise genetic variability and effectively reduce the chance of inbreeding effects in the new population on the revegetation site. Alternatively, it might be more prudent to target a larger population despite its increased distance from the revegetation site. The value of seed orchards (Barbour) and, in particular, seed production from cultivated stands (Chivers) highlighted this extremely important alternative to harvesting seed for revegetation from natural populations.

Seed Ecology

The conference highlighted the amazing complexity of environmental influences on seed germination and how innovation can be used to manage that complexity to achieve revegetation and conservation results. Pritchard described how the local environment affects seeds directly and demonstrated the potential for high plasticity in evolution of seed and maternal traits in response to vastly different local environmental conditions. Seed biology evolves to optimise resource use and germination success. Recalcitrant species dispersing seeds into reliably moist conditions direct resources away from protective coat structures, and food reserves tend to be greater. In cold and short growing seasons, seeds are smaller and germinate at lower temperatures. Success in enhancing the population of a critically endangered shrub through understanding and manipulating seed dormancy in the field was demonstrated by Cochrane. Tropical and subtropical soil seed ecology is

poorly understood. Weed control of major weed species can be promoted by better understanding of subtropical seed banks. Adkins discussed the potential to control major weeds by breaking seed dormancy with smoke. Koch showed how innovation and engineering can separate out the seeds from large volumes soil so that direct transfer of seeds can be achieved more efficiently.

Establishment and Management

The importance of research, information sharing and training in improving the results achieved by direct seeding were summarised in an overview paper by Carr and Bonney. The theme then focused on grasslands. Gibson-Roy described a trial in Victoria which showed that species number, functional group and individual species characteristics were significantly correlated with soil nitrate and light penetration. Other trials investigated site preparation techniques, and demonstrated that soil scrape, combined with herbicide treatment, effectively reduced weed emergence. For New Zealand, Ross described in detail some of the challenges and achievements associated with hydroseeding, including erratic seed production, viability, dormancy and storage issues, as well as weed competition and pest damage though some good results have been achieved with establishment of native plants on very steep, difficult sites. Meers demonstrated that soil seed banks have a role in the re-establishment of native vegetation in single rotation pine plantations in Victoria. Read described studies conducted at mines in the Hunter Valley of NSW, and in Queensland demonstrating that woodchip mulch, when applied as a thin layer, significantly increased the density of vegetation that established on top soiled plots. Bellairs outlined what storage, temperature and moisture conditions could be used to achieve high weed mortality in stored mulch and compost from green waste material used for revegetation in northern Australia. Finally, Maxwell gave a useful summary of practical experiences from a number of direct seeding rehabilitation projects conducted in south-east Queensland.

Dormancy and Germination

Seven presentations related to the impact of smoke or smoke-water on seed germination, and two to physical impediments to germination. A range of native species was covered that including those used in native floriculture, native grasses and legumes, shrubs, herbs, woody tree species, and species that are considered to be threatened. Dixon provided a very interesting insight into the considerable research effort into smoke and smoke-water that has enabled his group to identify the active agent in smoke. He described how current research is focussing on the derivation of analogs of the active compound to enable more widespread application in the natural, agricultural, conservation and restoration sciences. Other authors who reported results on smoke and/or heat included O'Keefe, Baker, Farley, Ashwath and von Richter. Positive effects of smoke were reported by O'Keefe using *Westringia crassifolia*, an endangered shrub, endemic to Victoria. Baker reported an increase in germination response to the application of smoke water to *Actinotus leucocephalus*, an annual herb. Smoke or smoke water application does not, however, universally increase germination. Fesuk and Ashwath reported the limited response of several tropical grass species and von Richter, working on grasslands in western Sydney, reported that less than 20% of the 49 native species in her studies were responsive to smoke, and that a significant proportion of species exhibited a form of dormancy which requires further study. Farley reported that smoke water did not significantly increase water uptake and respiration of germinating *Themeda triandra* seeds. In relation to fruit morphology Johnston presented results for two major floriculture

species, *Persoonia virgata* and *Leucopogon melaleuroides*, to show that removal of the endocarp enables germination to occur. Woodall also found that removal or fracture of the endocarp of sandalwood resulted in improved germination.

Currie presented a poster on studies that will focus on the conservation of two species, *Putenaea insularis* and *Beyeria subtecta*, that are considered to be threatened. Castor presented a synopsis of her studies on forest species that are being used for rehabilitation of mines in the Hunter Valley, NSW. Steadman presented a very comprehensive summary of recent developments relating to seed biology and the use of molecular markers that were presented at the recent international ISSS meeting in Wageningen, Netherlands. Persons interested in finding out more about this work should contact Kathryn directly at Kings Park Botanic Garden in Perth.

Other Presentations

Pearce and Probert presented a summary of the Australian projects supported by the Millennium Seed Bank, Kew, UK and a meeting was later held of personnel involved in these projects. The second presentation was made by Adkins on the case for an Australian Seed Science Society.

Seeds safe in the bank – for life

Tuesday , 23 November 2004



Professor Adkins (left) with PhD student Gemma Hoyle and researcher Grus Farley.

Scientists from The University of Queensland (UQ) have received a million dollar grant to set up the state's first-ever "seed bank" for arid zone native plants.

Called Seeds for Life UQ, the program is part of the international Millennium Seed Bank Project initiated by the Royal Botanic Gardens, Kew in the United Kingdom, which aims to collect the seeds of 24,000 native plant species worldwide– 10 percent of the world's flora – over the next six years.

The stored seeds will allow the conservation of native plant species, while associated research is expected to yield information for successfully rehabilitating mine sites and other degraded landscapes.

"In our project we're collecting the seeds of more than 700 mainly arid zone native plants which will be used to create Queensland's first-ever germplasm collection of this kind as well as a duplicate collection at Kew," project leader Associate Professor Stephen Adkins said. "That will build up stocks of rare and threatened species, complementing the conservation work going on in the field and ensuring we don't lose species to local or, worse, total extinction."

"At the same time, we will be researching the seed biology of each species to provide solutions to some of the most difficult environmental problems currently faced. For instance, improving germination or seeding efficiency, of our native plant species is one of the biggest challenges in landscape rehabilitation. Many species

have developed dormancy as a protective measure from the arid environment they grow in and will not germinate unless conditions are just right. Given conditions in mine sites and other degraded areas are rarely those of a natural environment, dormancy and other seed characteristics of some species can be such a problem that it precludes their use in revegetation projects, even when they are otherwise the most suited plant for that environment. A better understanding of seed biology will assist us to develop improved revegetation technologies for mine site, floriculture, forest and other ecological restoration projects. That means trying to identify the optimum time for collecting high quality seed, the best post-harvest handling and storage practices, germination protocols and dormancy-breaking techniques.”

Associate Professor Adkins said UQ’s research team of three senior scientists and two postgraduate students would also be involved in training others in the seed collection, handling and storage methods they develop to share any new knowledge and improve the expertise of people working in the field.

He said mining companies including BHP Cannington, Xstrata’s Ernest Henry mine, Zinifex Century mine, BHP Billiton-Mitsubishi Alliance and Rio Tinto had expressed particular interest in the project, contributing \$200,000 on top of the \$1.1 million provided under the Millennium Seed Bank Project. Other agencies including the Australian Centre for Mining Environmental Research Ltd (ACMER), Griffith University, the Brisbane Botanic Gardens, the Environment Protection Agency and Greening Australia are also involved in the broader state-wide program of which Seeds for Life UQ is a major part.

For more information, contact Associate Professor Steve Adkins on 61 (07) 3365 2072 or s.adkins@uq.edu.au

Africa

Pat Berjak writes: I really would appreciate receiving news from the 'Seed Community' in Africa! We Africans just don't seem to communicate about seed-associated research or regional interests, which leaves me with nothing to report for the ISSS Newsletter other than what we ourselves in South Africa are, or have been, doing. Please get in touch by e-mail, with newsworthy items. My addresses are: berjak@biology.und.ac.za or berjak@ukzn.ac.za.

Fifth 'Desiccation Workshop': This event, officially called the *International Workshop on Desiccation Tolerance and Sensitivity of Seeds and Vegetative Plant Tissues*, (sponsored by the ISSS) is planned to take place for a week within the first 10 - 14 days of January, 2007. The emphasis of these meetings is, as the name implies, particularly focused on a variety of aspects to do with acquisition and maintenance of the desiccation-tolerant state, and the causes and consequences of their absence. Topics range from the macro ecological and evolutionary aspects to molecular mechanisms. Research to do with handling and conservation of genetic resources of species producing desiccation-tolerant - and particularly, desiccation-sensitive, seeds is a consistent focus.

The 'Desiccation Workshops' also attract much interest from outside the seed community, particularly in terms of considerations of desiccation-tolerant vegetative

material, and all participants have found the seed/vegetative-tissue combination to be wholly synergistic. Instead of publishing proceedings, we opted - right from the first of these meetings - for publication of peer-reviewed papers in a special issue of *Seed Science Research* and, for the work on vegetative material, in an appropriate journal. Papers emanating from the first four 'Desiccation Workshops' appeared in special issues of *Seed Science Research* in 1994, '97, 2000 and '04, and those on vegetative material in *Plant Growth Regulation* (1998 and 2000) and *Physiologia Plantarum* (2004).

The Workshops, by popular vote, continue to be held in South Africa, and January is around mid-summer. The locations are some distance from the major cities, and are chosen for their scenic, plant, animal and other local interest. Although the 5th Workshop is still two years away, we'd appreciate receiving 'expressions of interest' (deswork@biology.und.ac.za) to get an idea of numbers. As arrangements progress, we will be reviving the Website (set up for the 2003 meeting) and will publicise this on Ralph Obendorf's SEED-BIOLOGY-L@cornell.edu.

USA

Seed course at Davis

The Seed Biotechnology Center at UC Davis is offering a two-day short course on Seed Biology, Production and Quality on February 2-3, 2005. This course presents the scientific and practical background for production, handling, storage and quality control procedures in the seed industry. It provides both a broad background and updates on current research areas to allow professionals in the seed industry, crop consultants and growers to expand and update their knowledge about seed biology, production and quality. Topics include pollination, fertilization and embryogenesis; physiology of seed development; seed health and phytosanitation; management of seed crop production; harvesting and conditioning to maintain and enhance seed quality; maintenance of genetic purity and identity; germination and dormancy; seed technology and enhancement; and future directions in seed biology and technology. Further information and enrolment is available at <http://www.extension.ucdavis.edu/agriculture/index.asp> .

● seeds get rhythm?

You may think that seeds kept under apparently steady conditions do not change but some interesting observations might make us wonder if this is always the case. Yitzchak Gutterman and Tanya Gendler have noticed that seeds of *Mesembryanthemum nodiflorum* seem to have an innate rhythmicity in their germination. Dry plants with mature seeds enclosed in their dry capsules were collected in the Judean Desert near Jericho, Israel, in summer 1972 and stored dry in room conditions. More than 31 years after maturation, these seeds retained a significant annual rhythm of germination. A significantly higher percentage of seeds originating from the terminal, central and basal part of the capsules germinated (in darkness at 15°C) in February or March of 2001, 2002 and 2003 than in any other month. At 25°C in darkness for four years from 2001 to 2004, terminals germinated best in those months. And terminal seeds always showed higher percentages. Is this

an inbuilt annual rhythm of germinability to regulate seasonal germination or is it a reflection of subtle, undetected changes imposed on the seeds? If anyone else suspects that their seeds have got rhythm please let us know!

● seeds get mobile?

Under the heading, "Let a thousand mobiles bloom", The Guardian newspaper (UK) on December 1 reported a development that might inspire seed scientists. Mobile phone (or cellphone) science is now in its third generation and worldwide the phones outnumber landlines. The rate at which the technology is advancing is impressive and many people (especially the younger generations) change their phone almost as often as their clothes. The result is that an enormous number of instruments are thrown away, in Europe alone over 100 million each year! There are sophisticated systems to recover precious metals from inside old phones but the casing presents a problem. Scientists at the University of Warwick (UK) may have solved the problem. They have designed a biodegradable case which can break down when thrown on to the garden or compost heap. This is progress: but the final touch is that a seed is embedded in a small, transparent window in the cover which then germinates when the casing is discarded in the proper place. A seed of a dwarf sunflower has been chosen for the prototype model (not yet commercialised!) but of course there are numerous other possibilities. At the rate at which old phone models are replaced it is not likely that viability or longevity of the mobile seed will ever be a problem.

● books

New book!

***The Ecology of Seeds*, by Michael Fenner and Ken Thompson**

Cambridge University Press

ISBN 0 521 65311 8 (hardback) -- ISBN 0 521 65368 1 (paperback)

Available from January 2005, price £55 hardback, £26 paperback.

The first comprehensive, up-to-date overview of the ecology of seeds for 20 years, focusing on reproductive strategies and the hazards encountered during reproduction, the evolution of seed size, the effectiveness of various dispersal agents, seed predation and frugivory, the functional ecology of soil seed banks, the definition and consequences of dormancy, factors influencing germination, the process of seedling establishment, the role of gaps in regeneration, and the influence of regeneration processes on the maintenance of species diversity in communities.

Seed ecology has expanded enormously in recent years and over 80% of references cited are from the last two decades. The text reflects the recent transformation in our understanding of many aspects of seed ecology, especially dispersal, persistence in soil and the ecological role of seed dormancy. The book also emphasises that regeneration from seed has fundamental impacts on the diversity and composition of plant communities. Seed ecology has played a central role in elucidating many fundamental aspects of community function of current interest to ecologists.

And remember....

CABI publications All ISSS members receive a 25% discount on books on seeds published by CABI. Currently on the ISSS website there is a pdf listing all books available (referred to as the 'ISSS Book Titles' on the website), another separate pdf of the order form (referred to as 'ISSS Book Order Form' on the website) and an ISSS Price list 2004.pdf. Remember that ISSS members can subscribe to *Seed Science Research* at a substantial discount.

● upcoming meetings

THE 8TH ISSS INTERNATIONAL WORKSHOP ON SEEDS, "GERMINATING NEW IDEAS"

The registration brochure for the 8th International Workshop on Seeds is now available at our web site: www.seedbio2005.asn.au. The Workshop is being held from the 8-13 May 2005 at the Sheraton Brisbane Hotel, Queensland, Australia.

The 8th International Workshop on Seeds represents a fantastic opportunity to come and germinate a few new ideas about seeds and further information can be obtained at the web site or by contacting Allison Bertoni-Remmes, Workshop Coordinator at Organising Committee, 8th International Workshop on Seeds, P O Box 1237 Milton Qld 4064 Australia. Tel: Int +61 7 3371 0333, Fax: Int +61 7 3371 0555, E-mail: info@seedbio2005.asn.au, Web: www.seedbio2005.asn.au
Plenty of opportunities are still available for sponsorship and exhibition packages.

2007 INTERNATIONAL WORKSHOP ON DESICCATION TOLERANCE AND SENSITIVITY OF SEEDS AND VEGETATIVE PLANT TISSUES

See **Africa**, above

2007 SECOND INTERNATIONAL SEED ECOLOGY MEETING

This meeting is proposed for Perth, Western Australia following on from the success of the first meeting on the island of Rhodes, Greece. Keep your eyes on these pages for further news. Contact: kdixon@bgpa.wa.gov.au

● and finally

If you have any suggestions, complaints, comments etc. send them along to your Officers. They want to run the ISSS as best as they can to satisfy the needs of its members. Please inform this newsletter (michael.black@kcl.ac.uk). about seed science in your lab, country, region etc, including any news about meetings or workshops.

A joyful festive season to all and a happy, peaceful, healthy and successful 2005!