ERGONOMICS AUSTRALIA

June 2002

Promoting systems spaces and designs for people
| Contents
<table>
<thead>
<tr>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Editorial</td>
</tr>
<tr>
<td>Vale</td>
</tr>
<tr>
<td>President's Column</td>
</tr>
<tr>
<td>Letters to the editor</td>
</tr>
<tr>
<td>Forum</td>
</tr>
<tr>
<td>Articles</td>
</tr>
<tr>
<td>Ron Cumming Memorial Lecture</td>
</tr>
<tr>
<td>Economics, Economics and Ethics</td>
</tr>
<tr>
<td>Maurice oxenburgh</td>
</tr>
<tr>
<td>Human Factors Performance in Coffee</td>
</tr>
<tr>
<td>Harvesting in Columbia</td>
</tr>
<tr>
<td>Juan Carlos Vélez-Zape, Esther Cecilia Montoya-Restrepo, and Carlos Eugenio Oliveeros-Tascón</td>
</tr>
<tr>
<td>Aquaculture and Ergonomics: Issues and Opportunities</td>
</tr>
<tr>
<td>Thomas Mitchell</td>
</tr>
<tr>
<td>Noticeboard</td>
</tr>
<tr>
<td>New Members</td>
</tr>
<tr>
<td>Conference Calendar</td>
</tr>
<tr>
<td>Information for Contributors</td>
</tr>
<tr>
<td>Information for Advertisers</td>
</tr>
<tr>
<td>EAOL</td>
</tr>
<tr>
<td>Caveat</td>
</tr>
<tr>
<td>Editor</td>
</tr>
</tbody>
</table>

The Official Journal of the Ergonomics Society of Australia
Volume 16, Number 2 (June 2002), ISSN 1033-1875

Editor
Dr Shirleyann M Gibbs
Email: shanng@optushome.com.au

Design and Layout
Acute Image Pty Ltd Tel: 03 9381 9696

Printer
Impact Printing
The Ergonomics Society of Australia Inc.
Creeda Business Centre
Bradfield Street, Downer ACT 2602
ESA URL http://ergonomics.org.au
Tel: 02 6242 1951 Fax: 02 6241 2554
Email: secretariat@ergonomics.org.au

Promoting systems, space and designs for People
Editorial

Thank you to everyone who so enthusiastically responded to the new style of “Ergonomics Australia” launched with the March issue. As seems to be the pattern, the earliest response came from overseas and that reaction from Lois Smith at HFES USA was a special delight after all the co-operative effort with our publisher, Acute Image, to put it all together. This June edition should build on that most promising start.

The new policy of publishing refereed papers is working well at this early stage. Two papers that were refereed but not available in time for publication in the ESA 2001 Conference Papers are included in this edition. Most oz ergonomists will know that Maurice Oxenburgh is travelling constantly between Australia and Sweden since Asa suffered a series of strokes and we were very privileged to have him with us in November and grateful that he has provided the outline of his presentation for publication in EA. The major article was offered from the team in Columbia and it has been a pleasure to work with Juan Carlos who wrote the original paper in Spanish and then translated it into English for a preliminary edit, prior to review by the two referees. All this prolonged the process — but the prompt cooperation across the Pacific was more reliable and timely than with some local ergonomists.

The September issue has two papers in the pipeline. The focus will be on perceptual areas of ergonomics and anyone who would care to contribute an article, case study or letter about this aspect of ergonomics is particularly invited to respond as soon as possible. While deadlines have been flexible in the past, there is much more work involved in preparing a refereed journal and time is crucial in these early days before a steady flow of articles generates a reserve for future publication. It is proposed to have the December issue feature sport and leisure ergonomics if such papers can be forthcoming. Publishing is both a privilege and a responsibility for professionals in any major discipline.

Maurice Oxenburgh’s paper stimulated your editor to form a brainstorming group to offer a symposium at the forthcoming CybErg Conference that is being organised by the South African Ergonomics Society this year. We had a great night, forwarded our proposal that has been provisionally accepted, and now we are busily preparing the position papers. David Brown has provided “a teaser” for this edition of EA to introduce our topic “Ethics and Ergonomics in the New Millennium” and hopefully entice you to participate during the CybErg Conference.

Ergonomics is a fundamental design science … the theme of 1994 ESA Conference, and this is an important message to publicise. Good and bad examples of presumed attention to ergonomics are to be found in many application domains and it behaves all practising ergonomists (not merely the certified variety!) to seek opportunities to promote the better use and understanding of basic ergonomics principles. The upgraded journal now offers an excellent avenue for information distribution to clients and an attractive option for corporate advertising. ESA relies on volunteers to conduct most of its activity … we need all members actively to promote this means of subsidising a steadily improving and valued journal.

One of the Society’s most respected founder members, Emeritus Professor David Fergusson died earlier this year. He had a profound influence on raising the profile of ergonomics as well as occupational health in this country. There are two contributions in this edition that pay respect to this outstanding man. Several other people, who were contacted, felt inadequate to speak of the full range of David’s influence, so the September edition is intended to include a collage of memories … a few sentences, paragraph or page from individuals … that will be combined as a fitting tribute. Please honour this man with your contribution.

Shann Gibbs
Editor
VALE Emeritus Professor David Fergusson

We regret to announce that Emeritus Professor David Ferguson died suddenly on 12 March 2002 a month before his 82nd birthday. His death came unexpectedly after an evening dining with friends and his wife Betty — and was probably just the way he would have wanted it.

While he had been retired for 17 years he was still working part-time on several projects and had regular contact with several colleagues in OHS. In 1976 he became the first Professor of Occupational Health in Australia and much earlier (in the mid-1960s) he was first in this field to take up ergonomics and to promote it as an integral part of workers’ health and safety programs. His professional influence was huge. He was a colleague, friend and mentor to those of us who were fortunate enough to study and/or work with him and we shall miss his guiding hand and insightful comments at critical times.

He was a great family man and will be much missed by his wife, Betty, and his children, grandchildren and great grandchildren. A full obituary will be included in the next edition of Ergonomics Australia.

Barbara McPhee

David’s passing takes from us one of our most active, enthusiastic and respected founder members. Those of us who knew him personally have lost a dearly loved colleague and friend.

My own association with David dates from 1965, when moves to form a society to promote research into, and application of ergonomics were gathering strength. David was a worthy member of a distinguished group which included Alan Welford, Ron Cumming, and John Lane, all Fellows of the Society. Their eloquent and successful advocacy set the framework within which the Society has developed.

The Branch structure of the Society, in which lies much of its strength, is in large part David’s legacy. He took great pride in announcing, barely two hours after formation of the (then) Ergonomics Society of Australia and New Zealand, the formation of the first State Branch, in his home state of New South Wales. He always took a quietly mischievous pleasure in referring to “our senior Branch”.

David’s election as Fellow of the Society was, for him, a complete surprise. As President of the Society at the time I had the pleasure of putting his nomination to the Annual General Meeting — the procedure for election in those early days. The nomination was approved by acclamation, in a storm of applause and cheering rarely heard at such an assembly. David, who had an unduly modest opinion of his own merits, was deeply moved, and lost for words — a rare experience for him. Needless to say his recovery was rapid.

In such a brief notice it is not possible to review David’s work and professional achievements. But his personal qualities must not pass without mention. His integrity, his loyalty to colleagues, especially to junior staff, his readiness to accept responsibility himself when things went wrong, his vision, impartiality and objectivity, his generous treatment of students and all who worked and learned under his leadership, inspired respect and affection which I am sure would have surprised him if he had not been too modest ever to be aware of it. He has left behind “that best portion of a good man’s life, His little, nameless, unremembered acts of kindness and of love”.

Colin Cameron
President's Column

President's Report on the discussions and decisions made at the May 2002 Ergonomics Society of Australia Board Meeting

The ESA Board is charged with the responsibility under the Society's constitution to administer the affairs of the Society. The Board meets a number of times each year, usually by teleconference. It meets twice each year face to face, once in May and again in conjunction with the national conference. The ESA Board had its first face to face meeting for 2002 in Brisbane.

In order to communicate the discussions and decisions in a broad manner I have summarised them below. Contact your Branch Director if you are seeking further detail on any of the issues that I raise below. Certainly some of the issues will be the subject of articles in EA either in this edition or in the next edition.

Present at the meeting were:
- Jim Carmichael Executive - President
- Margaret Cook Executive - Treasurer
- Roxanne Egeskov Executive - General Secretary
- Margaret Head President Elect
- Ken Horrigan Qld
- Jonathan Talbot NSW
- John Culvenor VIC
- Jenny Kerr ACT
- Verna Blewett SA alternative delegate
- Kerry Jones WA
- Roger Hall CHISIG
- Robin Burgess Limerick PAB

Membership Directory

A decision was made at the May 2001 Board meeting to publish the next edition of the ESA Membership Directory only as an electronic version (with hard copies being forwarded to Members on request). This decision was made in the context of attempting to reduce costs and balancing the books in conjunction with the commitment to accept the Branch budgets very close to their budget requests for the 2001-02 year. Now that we are at the end of the year, the Board has determined that there are sufficient remaining funds to produce the 2002 Directory in hard copy. Members can expect their 2002 edition once membership renewals have been received and contact details updated. This is expected to be in September/October 2002.

It was further decided that the membership should be further canvassed for their opinions regarding this service.

The Executive will write to Members advising them:
(i) of the requirement for Members to "opt-out" of the Directory if they do not wish to have their details published;
(ii) again of the ESA’s directive for Member’s not to on sell or pass on the membership list to external bodies;
(iii) that an electronic version of the Directory will be published on the ESA’s web site and that access to this will be through a password secured location; and
(iv) the issue regarding the hard copy versus electronic copy of the Directory will be discussed at the next AGM after Members have had an opportunity to trial the website location access.

Archives

It was acknowledged that the Society should be collating and archiving appropriately material that is available to Members and within the federal office that is of historical significance to the ESA. The ACT Branch will soon provide support to further review files. It was recommended that all material/records be consolidated where possible.

The Board discussed the need for a callout to all members for information on any relevant records in their possession that they may be happy to share with the Society. Members will be contacted through EA seeking any historical information they may have of interest to the ESA.

Honours and Awards

The Honours and Awards Committee of the ESA put forward a document outlining the Society honours and awards eligibility details. The document will be posted on the web page in the near future. In addition, Roger Hall advised on the creation of the CHISIG Gitte Lindgaard Award.

PAB Recertification

The PAB have been considering new arrangements with respect to the recertification of PCE’s within the Society. The Board decided that the current recertification process cease and that the PAB present to the Board in November a proposal for new arrangements that would require an ongoing commitment for professional development by PCE’s in accordance to a code (to be developed) that would outline ways that this could be met.

Members will be advised of future changes in due course.

Accreditation of Ergonomics Courses

The Board is committed to working towards accrediting Australian ergonomics courses. A number of discussion papers have already been developed previously. Activity by the Board was suspended in 1998 until the IEA guidelines for accrediting courses was finalised. The Board will be receiving a proposal in November that is expected to advise the Board as to how to progress this process with consideration to the IEA guidelines.

External Relations

Congress of Occupational Safety and Health Association Presidents (COSHAP)

This is a consortium of the ESA, SIA, AIOH, ACOHN and AFOM.

The Memorandum of Agreement between the 5 parties has been signed. Details of the aims and goals of COSHAP have been communicated in previous EA’s. There is growing stakeholder awareness of the group in OH&S circles. COSHAP now has observer status on NOHSC. The group has received a number of requests for representation. ESA was the COSHAP representative for the NOHSC Occupational Stress Forum. COSHAP is providing representation to the NOHSC review of the National Solutions Database and the OH&S Diploma Review of competencies, and the Incentives Forum.

COSHAP representatives will meet with Federal Minister Tony Abbott on 21st June in Sydney.
Through its membership of COSHAP, the ESA had representation at the NOHSC arranged review of OHS competencies within the national OHS training package at Diploma level. The Board acknowledged the contribution of John Culvenor and Vivienne Karabinas for their participation as ESA representatives.

Key Centre for Human Factors and Cognitive Applied Psychology
I attended the last Advisory Committee Meeting for the Key Centre at the University of Qld that was conducted in May.

It is encouraging to see that the Key Centre is interested in promoting the ESA/CHISIG conference this year and intend to encourage the ESA as an appropriate professional association for professionals and students aligned to the centre and the disciplines it teaches.

Ecumenical Services Qld & ACT
The Queensland Branch and the ACT Branch arranged ecumenical services to commemorate those who have died at work in association with the International Day of Mourning on 28 April. The Queensland service was very successful and is in its second year.

The inaugural ACT service was held on Monday 20 May and was also very successful.

The Board acknowledged the significant and extensive work undertaken by Elizabeth Bunker and Melanie McGaw of the Queensland Branch, and Jenny Kerr in the ACT Branch to ensure the success of these services.

Website Update/Communications Report
An expression of interest will be published in the EA for the position of ESA Website Editor. The position will be an honorary position appointed at this year’s AGM and will have two year tenure. This will be an extremely important position within the Society as the website is becoming more and more a vehicle for communication and referencing information about the ESA and about ergonomics. Airdrie Long, Kerry Jones and team have done a fantastic job to date with the revamping of the ESA web site. Have you visited it recently? Please consider this position.

The ESA is also reviewing the need for an 1800 or 1300 number.

Membership Form Redesign
The design of the membership form and the renewal form are being reviewed in combination. This will assist with the removal of repeat and redundant information.

Ergonomics Australia Update
The Board tabled a formal thank you to Dr Shann Gibbs (EA Editor) for her commitment to and realisation of the vision of the future generation Ergonomics Australia journal.

The Board encourages all Branches to facilitate Members to submit papers to EA.

Tasmanian Branch Creation
The Board has been aiming for the creation of a Tasmanian Branch of the ESA for the last 12 to 18 months. It will be
arranging meeting of Tasmanian based members (breakfast) during the course of the National Conference (including Tasmanian CHISIG members) to discuss the possible creation of a Tasmanian Branch. In addition the Board is attempting to facilitate professional development events led existing (mainland) Members and CPEs.

The Board will also actively promote a Tasmanian Membership drive at the HF2002 Conference and breakfast meeting with financial incentives of no administration fee with application for new members.

**Resignation of ESA federal secretariat and Future of Federal Office Operations**

Unfortunately, the Board received the resignation of Christine Stone (National Secretariat) at the beginning of May.

A number of options and strategies were mapped to ensure that the ESA secretariat functions continued and that the level of secretariat services to Branches and members were affected as little as possible in the transition period to when the new arrangements can be established.

The Board has decided to investigate the following two options:

1. Recruit an officer under similar arrangements in the ACT; and
2. Use of a professional Association Management Service.

**Membership Drive**

The Board discussed a number of strategies with the aim of increasing the membership of the ESA. This will become a priority issue for the rest of 2002 and into 2003. Strategies include:

- Articulating the benefits of membership of the ESA (see this edition of EA);
- commencing a membership drive to recruit members of the ESA and to offer incentives to existing members to encourage their efforts in recruiting new members;
- targeting students of ergonomics courses and ergonomics related courses (see this edition of EA for more details) in a membership drive;
- developing a PowerPoint/OHP presentation for ESA membership and distributing a copy to each Branch for use at appropriate under-graduate and post-graduate courses (it is also to be placed on the website);
- following up all non-members attending the HF2002 Conference and all national conferences in the future for potential membership; and
- ensuring that new applications received at or within 1 month of the national conference will have their application administration fee waved.

**Student Membership drive**

The Board decided that application administration fees will be waived for all full time student applications.

The Board discussed setting up a special “opportunity period” of 4 months duration (30th June 2002 to 31st Oct 2002) for membership to the Society for the amount of $60 for full time students.

**2003 National Conference**

A number of options were discussed regarding the format of the 2003 ESA national conference. It was acknowledged that the ESA intended to support the IEA congress in Seoul in the second half of 2003 and did not want to compete with the IEA Congress. Therefore it was decided that a smaller conference in Australia based largely on a workshop series format would be the preferred option for 2003. The Board noted its preference for a national organising committee. The Board recommended that it again approach CHISIG to determine if a combined conference would be possible based preferably in Brisbane. If this was not feasible then the Board supported a series of workshops to be held in Adelaide. Robin Burgess-Limerick (UQ) offered to pursue the Brisbane option in the first instance.

**2004 National Conference**

The 2004 national conference will be held in Cairns in conjunction with the Pan Pacific Council of Occupational Ergonomics (PPCOE). The organising committee under the Chair of Melanie Mcgaw has already commenced planning. Barbara McPhee is the PPCOE representative to the organising committee and will be the official liaison between the ESA and PPCOE.

**Merchandising - T Shirts**

ESA T-shirts will be available sale at the ESA booth at the ESA/HF2002 National Conference in Melbourne in November.

**ESA Research Sponsorships**

One of the constitutional aims of the ESA is to support and encourage ergonomics research. A set of general criteria and conditions for sponsoring research were developed for financially assisting various research projects. These criteria and conditions will be published in EA.

The Board discussed the principle of using yearly interest earned by the Society for the purpose of funding this initiative. The Board could elect to use other consolidated funds for sponsorship in special circumstances if required.

A motion was made and carried that the total funding of research sponsorship per year should not exceed the interest generated in the previous financial year.

**Curtin University Research submission**

A proposal was received by the ESA to provide some support to an ergonomics research project submitted by Dr Leon Straker at Curtin University. The Board approved the project proposal in principle, for sponsorship across 3 years subject to the conditions agreed to at this meeting. The proposal will be published in the ESA and the topic is on the area of children/students and their use of laptops.

**OH&S Library Consortium**

NOHSC has put forward an offer to a number of professional associations to join in a consortium that provides access to the OSHROM database by the individual members of these associations. This database has been trialled in a number of States by members and it has been determined that access to this
database would be a significant benefit to members. The Board also recognised the need to avoid an exclusive OHS focus on membership services and discussed the potential for an additional financial commitment to “Ergonomics Abstracts Online”.

The ESA will be accepting the offer to participate in the OSHROM Consortium and thereby providing a valuable service to its members. More in the next EA.

**Budget and Finance Planning 2002 - 2003**

The Board spent considerable time discussing Federal and Branch budgets for the next period.

The fees for the next renewal period (2002-03) were determined, based solely on a CPI increase (rounded) as follows:

<table>
<thead>
<tr>
<th>Level</th>
<th>Previous Fee</th>
<th>CPI Increase</th>
<th>New Fee</th>
</tr>
</thead>
<tbody>
<tr>
<td>Associate</td>
<td>$110</td>
<td>CPI increase</td>
<td>$113</td>
</tr>
<tr>
<td>Member</td>
<td>$200</td>
<td>CPI increase</td>
<td>$210</td>
</tr>
<tr>
<td>CPE</td>
<td>$265</td>
<td></td>
<td>$275</td>
</tr>
<tr>
<td>Corporate</td>
<td>$440</td>
<td></td>
<td>$455</td>
</tr>
</tbody>
</table>

**ESA Members as official representatives to external bodies**

The current list of ESA representatives to external committees was reviewed. Several temporary appointments have been made until the process for appointment was reviewed. The guidelines for official representation will be reprinted in EA.

A list of official representations will be maintained by the Federal secretariat.

**Name of the Society**

Discussion occurred about the Society’s name. The discussion largely originated from the continuing perceptions of the Society having an on-going emphasis on occupational ergonomics/OHS to the exclusion of other domains of ergonomics. Members of the Board believed that this has influenced perceptions of the relevance of the Society to the wider application groups within ergonomics, particularly design, cognitive ergonomics and computer-human interaction. There was debate on the need to extend the title to describe the broader application and relevance of the Society. It was decided to open the debate and to put forward a name that embraces the wide application of ergonomics. There was debate on the need to extend the title to describe the broader application and relevance of the Society to the wider application groups within ergonomics, particularly design, cognitive ergonomics and computer-human interaction. There was debate on the need to extend the title to describe the broader application and relevance of the Society. It was decided to open the debate and to put forward a name that embraces the wide application of ergonomics. The discussion will commence in this issue of EA.

The Board is to develop an article “What’s in a Name” for EA, Simplicity (the CHISIG newsletter) and Aus Ergo Online to open the debate on a potential name change for the Society. The name change to be put forward is the Ergonomics and Human Factors Society of Australia.

Jim Carmichael
President
Ergonomics Society of Australia Inc.

---

**Letters to the Editor**

1. You will be aware that this year the Ergonomics Society of Australia, in association with its special interest group CHISIG, is hosting its annual conference, branded as HF2002 Human Factors. This conference will offer an excellent opportunity for your business to promote its services to a very specific target audience. More importantly, the conference is also a terrific venue for you to overtly demonstrate your leadership within and support for the profession of ergonomics in Australia. This can be achieved in two major ways:

   1. Your attendance at the conference!
   2. Sponsoring the conference.

The hard working conference organising committee has already won the conference’s premier sponsorship through the significant support of WorkSafe Victoria. The ESA is now looking at gaining sponsorship support for a number of the minor sponsorship packages. In particular, we are seeking sponsors for the following special events:

   - Conference Dinner $3,850
   - Welcome Cocktail Party $2,200
   - Luncheons $1,100

Benefits are listed in the sponsorship package. The conference committee would be happy to negotiate a package to suit your requirements. Of course, there are other sponsorship opportunities as detailed in that package.

Please contact Stephen Hehir on 03 9204 5456 or stephen.hehir@auspost.com.au. I urge you to seriously consider your ability to support the profession. A strong support base from the leaders of the profession sends a clear message to the consumers of the ergonomics community - that the profession is strong, growing and supported by its practitioners.

See you at HF2002!

Jim Carmichael
President
Ergonomics Society of Australia Inc.

2. My name is Deborah Abratt and I am writing from South Africa to find out whether there is the possibility for employment for me in Australia. My general qualifications are that I am a qualified Physiotherapist with an honours degree in Ergonomics from Rhodes University (Grahamstown). Although I believe my degree was of a high calibre (taught by Professor Pat Scott, who sits on the IEA executive committee), the work opportunities here in South Africa are very few and far between. I am very keen to get involved in the high standard of Ergonomics work being done in Australia. I am a very motivated, hard-working person who is dedicated to the field and is prepared to undertake a range of work options. Potential areas include research, consulting, design or education. I can send a copy of my Curriculum Vitae to anyone who is interested in employing me.

Regards,
Deborah Abratt
Address: 303 Clairwood, 1st Avenue, Kenilworth, Cape Town, 7708
Email: DeborahAbratt@hotmail.com
3. To all ESA members

By the time you read this there will have been changes at the National Office.

I tendered my resignation at the end of April to take effect on 28th June 2002. As this was not something that I had planned, I have as yet not decided what I will do after I finish here, although I have volunteered my time to several worthy organisations for at least two months, after that we will wait and see. Things can change overnight if one is in the right place at the right time it would seem. As some of you may know, Tony (my husband) retired from the RAN in January after 34 years ... initially to relax and enjoy life ... but just to show how things can change overnight — he has gone to work for the Defence Department as a civilian.

For many of you I was just the person who sent out the renewal forms etc; but for others we spoke on the phone via e-mails and in many cases at the past three conferences. I have enjoyed much of my time working for you. I would like to thank all those that I have worked with over the past three and a half years and to wish you and the Society all the very best in the future. Who knows, we may meet again at some time in the future.

Many thanks also to those who have wished me well in the future; it is much appreciated.

Regards
Christine Stone
[Ed: In the event, Christine actually left on 29th May.]

IEA COLUMN

1. The IEA Executive has decided to conduct this year’s meeting on the first weekend of September in Santiago, Chile. Both Margaret Bullock and I voted for the alternative option of Stockholm, Sweden owing to the significantly lower cost and the more accessible travel from here. At this stage the ESA delegates are not planning to attend this year, but will attend the main triennial meeting prior to IEA 2003 in Seoul, Korea next year. The ESA delegates will offer an opinion via proxy votes once the agenda has been finalized.

2. It is recommended that the ESA encourage members to support the IEA triennial Congress to be held in Seoul, Korea next year. Follow the deadlines via the IEA Congress website.

3. Margaret Bullock has been assisting the Accreditation Committee of the IEA with the draft Accreditation Guidelines initially circulated in 2000. It is expected that these will be posted on the IEA website for members to review.

4. The ESA initiative of book donations to IDC members continues.

5. The ESA is also working with ICOH projects via Barbara McPhee.

6. ESA members should consider nominations for the IEA Fellows and the Liberty Mutual prize both of which are important recognitions of professional contribution to ergonomics.

David Caple
IEA Delegate

Forum

(1) Possible ESA Name Change

Discussion opened by Verna Blewett on behalf of the ESA Board
Since its inception, the ESA’s Computer-Human Interaction Special Interest Group (CHISIG), has consisted of some ESA members and many non-ESA members. As a Society we have taken numerous steps to encourage the non-ESA members of CHISIG to join ESA and be involved more generally, with unfortunately little impact. There is much to be gained from a closer association between members of these groups, our domains of interest have significant overlap – workplaces and working with screen-based equipment, software design, hardware design, cognitive ergonomics, semiotics and screen design. Why has this close association been illusive?

The ESA has had an overwhelming and persistent attraction for those of us involved directly in occupational health and safety, but, with the exception of a few stalwarts, little long-term attraction for people involved in psychology, industrial design, engineering, architecture, cognition, and design for the disabled ... the list could go on and on. There are so many disciplines where ergonomics is fundamental to effective practice, but we see few representatives of those disciplines participating in the activities of the ESA. As Society members we all miss out when our diversity is limited. The strength and value of our knowledge base depends on input from many different frames of reference; this encourages lateral connections and serendipitous discovery. As well as CHISIG, why couldn't we have other large and active special interest groups: for example, DesignSIG, ProductSIG, BuildingSIG, AutodesignSIG and so on. Under such circumstances OHS would be just one small part of the Society and relegated to its own ‘OHSSIG’!

This matter was the topic of some discussion at the most recent Board meeting of the Society (May 2002), and I have been charged with the responsibility of opening this discussion with you.

It seems that one reason that things are as they are may be that there are many people out there who believe that ‘human factors’ is of importance to their professional development and functioning, but they have little understanding about ‘ergonomics’; more frequently confusing it with ‘economics’ or ‘agronomics’... The notion that the two terms describe different domains of knowledge appears to be rife in non-ergonomics circles. I’m presuming that most members of the Society would regard the terms as synonyms – certainly I was always taught that this was the case! So, perhaps we have a case of mistaken identity? Until recently the British used ‘ergonomics’ and the Americans used ‘human factors’ - could this be the genesis of confusion?

The murmurings I have heard around the Society have been that we need to go with the flow. We need to demonstrate that we are inclusive and market the Society and ourselves as open to all those with interest in ergonomics, human factors or whatever term they prefer. There seems to be some feeling that we have spent a lot of time and energy trying to market the term ‘ergonomics’ and that this emphasis may have been misplaced.

Perhaps, some people suggest, we should market the principles of...
ergonomics, rather than the term, and in the process of doing this, use other terms as well.

A very obvious demonstration of this would be to re-name the Society as the “Ergonomics and Human Factors Society of Australia” (or some combination of these terms). I admit to some ambivalence about this. The obvious downside of the suggestion is that we actively re-enforce the notion of difference while trying to be inclusive. That is, it is not logical to name a Society tautologically; therefore an outsider would assume that the terms must have different meaning. (Can you imagine a “Water and H2O Society”?) On the other hand, this might be a small price to pay if it were to result in improved understanding and wider acceptance of the Society and its objectives. If we were completely Machiavellian, we would recognise that such a long name, being a mouthful, would probably have a life of about 10 years, after which time some bright spark would have the idea that the Society name could be shortened and still be seen not to leave anyone out... At least there is a precedent in that the US Human Factors Society has recently changed its name to the ‘Human Factors and Ergonomics Society’. But despite this, such a move could not take place without considerable discussion amongst the membership. It would need a Constitutional change. Let’s start talking about it. What are your thoughts?

(2) Ergonomics and Ethics in the New Millennium

A team including Maurice Oxenburgh, Barbara McPhee, Pepe Marlow, David Brown and instigated and co-ordinated by Shann Gibbs in response to Maurice’s paper in this edition of EA, plans to open the ethics discussion on an international basis at the forthcoming CybErg Conference in late September. There are many aspects of this dilemma that confront practitioners in diverse fields of ergonomics. David Brown has provided the following “teaser” to promote ESA member participation.

Who needs ethics?

Ethics traditionally concerns the vertical dimension, the idea that some things are higher and more important. But in today’s society, many refuse to acknowledge the vertical. They see ethics as irrelevant, culturally biased, even damaging.

So, is the vertical dimension an entirely subjective and optional way of experiencing the world – one delusion among an infinite number - or is it true for all people, awaiting each person’s awakening to it?

There appears to be no way to settle that question. Even so, the ergonomics profession is entitled, if it chooses, to speak of the vertical. It might need re-framing for the 21st century - for instance, to speak of “acknowledging the whole”, so as to remove the judgmental flavour. But to abandon the vertical dimension, when it has been held as vital by professionals throughout recorded history, would seem at least foolish. We are no smarter than our ancestors, and we should at least try to understand why they were so insistent about this!

There are at least three other approaches to ethics, which do not rely on values or tradition. Games research shows us that some ways of behaving produce better overall outcomes for the whole group. A society of ergonomists must represent the group.
Therefore the group is entitled to teach its members the rules of
good behaviour, to avoid the need for each of them to learn
through painful experience. That approach sets at least a bare
minimum ethic.

Happiness research shows us that people who believe in
something are happier and healthier than those who do not.
Exactly why is unclear, but in the meantime we can at least
consider ethics as a public health issue.

A third approach is to simply make a catalogue, from which
people can choose. For instance:

Ergonomist / Tradesman
Favourite question: “What’s wrong?”
Fixes things, gets paid, goes home.
Ethics: Do a good repair.
Anti-ethics: Do a quick job with cheap parts that meets bare
minimum standards. If customer has a problem, avoid responsibility.

Ergonomist / Artisan
Favourite question: “What do you want?”
Accepts commissions, creates beauty, seeks mastery;
Ethics: Give client what they want.
Anti-ethics: Do your own thing no matter what the client wants
or needs.

Ergonomist / Witchdoctor
Favourite question: “Why do you want that?”
Senses the whole, sees detail too;
Sees things that others can’t, and explains them;
Constantly searches the unknown, seeks to know more.
Ethics: Give client what they need.
Anti-ethics: Indescribable?
Witchdoctor sounds more interesting to me. I’d like to be one;
is anyone coming with me?

The Team’s Proposal: Ethics and Ergonomics in the New Millennium

Introduction

At the start of this millennium there are considerable pressures
that affect individuals and organisations in the wake of a general
relaxation of religious morality codes of behaviour. What, if any,
should be the governing principles that may fill the apparent
vacuum?

Position 1: Do we need guiding ethical principles — are ethics
still relevant in 2002?

Ethics are always relevant and more especially in a market economy
where greed is encouraged. In public companies the over-riding
legal responsibility is to maximise returns to the shareholders. In
ergonomics, whether it is in design, injury prevention or systems
operation, the ergonomist has a responsibility to the community
at large (that may or may not include shareholders in a particular
enterprise). There is frequent conflict between the two categories
and the necessary guidelines (codes of practice) must be derived
from ethical principles (codes of ethics). These principles should
ensure a consistent approach to the small everyday decisions that
are adopted by individuals and organisations. The alternative to
this approach is to support the law of the jungle — simply the
survival of the strongest or most Machiavellian professional. In
essence, ethics describe a Platonic concept of an ideal that should
be our aim even when our performance may fail to achieve the
absolute goals.

Position 2: What ethical principles are key issues in the practice
of ergonomics?

It is difficult to avoid reference to the Ten Commandments!
While there may be a clash between ethical principles that does
not provide an excuse for their avoidance! A charter for
ergonomists should include the following:

• Do no harm. An age-old principle but a first principle for
ethical ergonomics.
• Do good. This is not merely the reverse of do no harm but a
positive imperative.
• Ensure equality between parties. This acknowledges that one
person does not have all the answers and others may have
equally good or even better ideas.
• Ensure justice and fairness in all interactions with clients and
colleagues.
• Exercise truthfulness and honesty in all matters — while
realising that truth is seldom absolute and a collegiate approach
may be necessary.
• Support and disseminate the science of ergonomics — while
acknowledging that this is not the same as supporting the
ergonomics profession or societies.

Position 3: Intellectual property - the real life application of the
ethical dilemma.

It may not be reasonable to expect people to arrive at an ethical
decision in isolation from a peer group. This is especially apt where
there are conflicting alternatives and the optimal decision may
not be entirely clear. This dilemma engages the principles of do
good and do no harm. In resolving these issues there is little scope
for arbitrary action by one individual as there is little protection
for either party when mistaken perceptions may be operating.
Professional behaviour may rely upon access and accountability
to a formal Council of Elders as a means of determining the
boundaries of legitimate practice or the promotional, commercial
and academic encroachment on the work and intellectual property
of fellow practitioners. The extent of due acknowledgement of
another’s property may need clearer definition to avoid the risk
of various forms of plagiarism. Since to copy is oft regarded as
the sincerest form of flattery it is unlikely to be eradicated!

(3) Recertification and marketing of PAB

Some respectful comments about “What” and “How” the
Professional Ergonomists (PABs) should do about recertification.
As a PAB member, I would like to offer:

1. Think outwards, not inwards. Transfer the energy required to
run a certification routine into marketing the PAB instead of
debating its membership criteria. Marketing is not “advertising”:
it is the business of identifying who might need you, why they’d
want you, and how to communicate with them.

2. Persisting with self-regulation activities only prolongs the
navel-gazing that has choked most local ergonomics from
securing a credible foothold in Australian industry this past decade. We all know how great ergonomics is; the trouble is that few others do. Priority ought to be given to understanding this problem and addressing it. Several other groups (not ergonomists) have captured the ground we hoped would be ours — OH&S, exercise, workplace design, product advice, etc. Nobody does these things as well as a trained, qualified ergonomist. But who out there agrees with this (apart from us)?

3. In 1990 the PAB prepared a marketing plan akin to what the accountants were doing at that time to get their CPA recognition. The PAB Marketing Program listed target markets for ergonomists, how to get to them, what to say, and how to evaluate inroads. Does anyone know about this?

5. Why have so many PAB members drifted away from day-to-day involvement with the ESA? I urge my fellow PAB members — no doubt working successfully as ergonomics consultants — to take their experiences and “market knowledge” seriously. There’s not enough ventilation in the ESA of what actually works in exciting clients to whom we deliver ergo solutions. PAB ergonomists who can cut a living will usually have learnt (the hard way) how to sell (and keep selling) ergonomics. We need to talk to each other about successes and failures. The answers are rarely found formally in the ESA, and not in academia.

6. My point is that we PAB people might turn our minds more to that side of things instead of worrying who should be in or out, and what the rules are.

Mark Dohrmann
Melbourne

Editor: So now it is over to the membership to join the debates outlined above.
1. INTRODUCTION
In this lecture I will address the ethical basis of ergonomics practice. We have Codes of Practice but do they address the professional ethical issues and, in any case, what are the ethical issues? Are we a business or a profession and are we clear who we are serving — who is the client?

2. ERGONOMICS
Firstly I will make clear who I am addressing; I will be looking at ergonomists when they are acting as ergonomists, rather than in one of their primary professions. My example during the lecture will be taken from a typical physical work study where one is called upon to improve working conditions and to avoid injury (e.g. a dispatch area where the employees are packing and loading). The example is for convenience only and I do not exclude other forms of ergonomics in psychology, design, home ergonomics, and transport ergonomics and so on.

3. ECONOMICS
I will use economics in two ways: firstly to discuss cost benefit analysis and secondly to look at our personal economics, the ergonomists’ income.

1. Use of cost benefit analysis to encourage the use of ergonomics in the workplace.
What is the morality of saying ‘ergonomics is good for business’? Supposing it is not and the pay-back is many years or never? Do you abandon doing anything?
One way of overcoming this ethical dilemma is to say that cost benefit analysis is one method of persuasion to introduce better working conditions but not the only one. One only uses a method of persuasion if it is an effective way!

Ergonomists need to make a living.
In the Ergonomics Society of Australia (ESA) there has been a substantial change of membership in last 20 years from secure employment by large companies and governments to less secure forms of employment; self employed, as associates or in small companies. We are part of the precariously employed and this may change the way we approach professionalism. Are we a business or a profession?

4. ETHICS
It is usually assumed that we all know what ethics is but ethics is a bit like describing green without using wavelengths or pointing to something you say is green – or describing green to a person who is red-green colour blind. Many philosophers have had a go at describing ethics but seem to come to no agreement so we will start from the beginning and ask what are our ethics or what should be our ethics?

We, as ergonomists, do not seem to discuss ethics much and, unfortunately, the Codes of Practice do not seem to start from the ethical foundations for professional practice. There is almost nothing in the ergonomics literature on ethics so we need to start somewhere else although, in the final analysis, one’s own ethical principles and practices are one’s own choice limited by one’s peers and social practice.

If ergonomists do not deal in ethics at least the medical profession has thought about it. One of the problems in medicine is when to stop procedures to keep ill people alive and who will not recover: when to pull the plug? I have taken some of their ethical principles and modified them to be suitable for ergonomists:
• do no harm; a moral obligation not to harm others,
• do good; a moral obligation to assist those who need assistance,
• equality and autonomy: respect between the parties involved (the medical terms included the patient and the patient’s choices, relatives, physician and other health practitioners), and
• justice and fairness; to act fairly to others (in the medical case it includes the distribution of scarce resources).

Do no harm/do good. That is an easy one for ergonomists. We always do good and never any harm, or do we?
To take our example of going into the dispatch area and changing the bench heights and putting in a conveyor belt; there will be no more back injuries in that place now. But although we have reduced the risk of injury (we have done good) we have also increased productivity and now only four people are needed leaving two people with no job (we have done harm).

Equality and autonomy. This leads to the real difficulty — who is the client? With a physician the client is the patient with the broken leg but who is our client; the person at risk of injury or the one who pays us?
Paul Branton, an English ergonomist, conceived the concept of person-centred ergonomics. He started with the concept of the whole person – the individual’s psychology, physiology and philosophy. Branton saw clearly that the client is the person or persons at risk and most of us would agree with this. This is certainly the way that I was introduced to occupational health and safety although we were encouraged to look at the whole system but Branton went one step further to consider the person first.

But has our concept of ergonomics subtly changed over the years and have we, as precarious workers-cum-ergonomists, changed our perceptions of our clients? Even for those of us in secure employment there have been pressures to view, not just the health issues of ergonomics, but the financial implications of, for example, legislation.
What about *justice and fairness*? Three people are involved — ergonomist, employer, employee — and can all three be treated fairly? Not only may there be differences in education, outlook and class structure but also in their relative positions. We are the outsider and on the inside there is no equity between employer and employed so how can we expect there to be justice?

We may overcome some of this by engaging in worker participation but, due to unequal knowledge and power basis it is not necessarily successful. Some research work has shown that some aspects of worker participation actually lead to stress.

One other ethical principle I would like to put forward is that of Bertrand Russell’s: an action is ethical if it gives one self-pleasure; ethics is active and self-centred. One’s actions must satisfy one’s inner soul or feelings and, putting this into our context, unless we are happy being ergonomists we may not do a competent job. I will use self-happiness with one’s work as an ethical principle or at least one that is essential to good professional practice.

In the old days one could go to a priest or rabbi and get advice without the thought of money; disinterested advice was given according to known principles. But as soon as the professions expanded into lawyers, accountants, financial advisers and so on and money changed hands there has been this conflict of interests and loyalties; the conflict between being a business and being a profession.

In some of the professions there is relatively little problem with money changing hands and affecting the advice given. For example, if one goes to lawyer ones expects to pay but expects advice that benefits the payer not the lawyer. There is at least a measure of equality between the two as it is a one-to-one relationship and the client can choose not to take the advice given. However, in some of the other professions there may be commissions paid of which the client may know nothing and which may compromise the advice given.

In ergonomics it is by no means simple. Not only do we have a clash between being a profession and a business but we have the added problem of ‘who is the client’; the one who pays or the one at risk of injury? We seem to have two clients but clearly they are not of equal standing.

As a side issue, the Ergonomics Society of Australia (ESA) Code only applies to the professional grades although there is no indication of why this should be. I assume that if one belongs to a professional society then one is bound by the codes of that society. The Human Factors and Ergonomics Society (USA) Code makes it very clear that all who are admitted to membership of the society are bound by the Code. I hope that the ESA Board will look at this and consider binding all members equally in their practice of ergonomics.

Taking our ethical principles as a guideline, does the ESA Code of Practice measure up to these? Do we have ethical guidelines for the practice of ergonomics as a profession rather than as a business?

In fact, and I am sure this will be disputed; the ESA Code hardly deals with the professional ethical issues. The Code is principally a guide to working honestly and ensuring that others do too (be good and be honest”) i.e. one should only work in areas of one’s expertise, do not run down other members of the society without good reason, uphold the good name of the Society and so on. These are good business ethics and practice.

I really think that we must should look at the professional ethical issues and derive procedures and practices from them. Generally speaking the Codes are fine as far as they go but they give little clue regarding the ethical principles from which we should work in the profession of ergonomics.

**Do no harm and do good.**

The ESA Code does give some assistance in this.

**Point 5. Provide advice, express opinions or make statements honestly, objectively, impartially, expeditiously and reporting on the positive and the negative consequences of that advice.**

In the example of the dispatch department, the positive side is the reduction of back injury risk and the negative side is the loss of jobs. You may feel that it is sufficient to lay all the consequences on the table in your report and let others decide; it may even be the only practicable way but we do have some residual responsibility. Is being ‘transparent’ in our report enough to get us off the ethical hook? We are doing good to some people but, in this day and age, almost certainly harm to those who lose their jobs.

**Equality and autonomy.**

The Code seems to give some assistance here.

**Point 1. Ensure that the community and clients’ well being take precedence over their responsibility to sectional or private interests.**

I am sure we all agree that the good of the community (no matter the size or scope of the community) must take precedence over our personal interests but who is the client?

In the Brantonian view the client is the individual at risk; that is, those people packing and lifting parcels in the dispatch department. In the business view the client is the one who pays. We would instinctively agree with the Brantonian view that it is the individual at risk who is the client but point 7 of the Code seems to indicate the business view - that the one who pays is the client.

**Point 7. Disclose to their employers or clients promptly and effectively all significant financial and other relevant interests ...**

This would indicate that the client is in the same category as the employer, ‘he who pays the piper calls the tune’.

**Justice and fairness.**

There is some mention of the concepts of justice in the Code but only relating to other members (point 4) or to the Society (point 3) and not to the clients.

**Self-satisfaction or self-happiness.** One cannot expect a Code of Practice to say ‘go out and enjoy yourselves’ but that must be the underlying theme of any profession; if you do not enjoy what you are doing it is unlikely that you will do the task competently.
CONCLUSION
The Codes of Practice are what they say they are: business practices. They give us little or no guidance on the essential elements of the professional ethical issues of who is the client? We have to face up to the difficulty of having dual loyalties; to the person paying us, and to the person at risk of injury. This, perhaps, is the crux of the ethical principles that we should contemplate and deliberate upon.

We, as ergonomists, seem to be caught between the devil and the deep blue sea and I am not at all sure how we can resolve these ethical issues. However, I am convinced that if we are to be truly professional these ethical issues must be tackled within the Society and be subscribed to by all who practise ergonomics.

2. HUMAN FACTORS
PERFORMANCE IN COFFEE HARVESTING IN COLOMBIA
Juan Carlos Vélez-Zape
Esther Cecilia Montoya-Restrepo
Carlos Eugenio Oliveros-Tascón

SUMMARY
In the National Coffee Research Centre — CENICAFÉ, an operative study of manual coffee harvesting was developed in which movements involving furrow, tree, branches, and the hands of 4 pickers of similar physical aptitudes were described and quantified. Data about operative variables (efficiency, effectiveness, quality and losses in the process) were also registered. Based on this information an ergonomics analysis was made that allowed the establishment of a new method, which was evaluated in field trials that indicated up to a 36.8% increase in the efficiency and a diminution of 36.4% in losses. This new approach resulted in process effectiveness and quality improvements of 1.4% and 18.5%, respectively. During this evaluation, symptoms of over-effort or fatigue were not observed in the coffee pickers.

Keywords: Colombia, coffee, manual harvesting, movement study, ergonomics study, improved methods

INTRODUCTION
The coffee harvesting in Colombia is conducted manually by a process in which only mature fruits (red coloured) are detached. They are differentiated because they present a red (similar to a mature cherry), or yellow colour. The association of mature fruits and their wet processing produces a drink of excellent sensory characteristics (Puerta, 1999).

In the country, 55.3% of coffee growing areas present slopes greater than 75% (Caballero & Baldión, 1996) and 33.4% of the areas have plant densities greater than 5000 plants/ha (FEDERACAFÉ, 1997). Owing to climatological effects in most of the coffee zone, the production is concentrated in two periods during the year (Arcila et al, 1993; Alvarado & Moreno, 1999). In spite of this, it is common to find one branch with green, unripe fruit as well as mature fruit. As a result, the necessarily meticulous and slow compilation occupies a large number of pickers. This scenario has made the development of mechanisation technologies for coffee harvesting very difficult. Currently, the process relies on manual labour and operates under a payment scheme that is proportional to the amount of mature coffee collected.

In addition, this labour is of agronomical interest, because improper harvesting favours the attack of coffee berry borer, Hypothenemus hampei, (Bergamin, 1944) the main plague of coffee in the world (Le Pelley, 1968), which can destroy up to 60% the fruit of a harvest (Reid, 1981).

Some investigations have been developed on manual systems for coffee harvesting in other countries. Wang (1960) accomplished...
an analysis of hand micro motions of pickers in Kona (Hawaii) that proposed some process improvements. Dixie (1979), Goyal & Rivera (1987), Kratyk & Forof (1987), Eschenwald (1957) and Chamorro & Oliveros (1995), reported on the development of simple devices for detaching the fruit but the results have not been promising owing to the human factor aspects of their designs. The use of canvas sheets has been reported by Cannel & Browing (1970), Guia Rural (1991) and Cambronry (1978) for processes by which all the fruit are detached without regard to their degree of maturation. At a later stage, fruit are subjected to a dry processing. Vicente et al., (1969) reported the use of canvas for the capture of fruit that fall off the tree naturally. Fruit obtained in that way produce a coffee drink of low quality.

Since the beginning of coffee cultivation in Colombia in the middle of the 19th century (Junguito & Pizano, 1991; Chalarca, 1998), no studies have been developed to assess and improve coffee harvesting techniques although such labour accounts for between 35 - 42% of the total production costs (Chamorro & Oliveros, 1995; FEDERACAFE, 1999). Consequently, as of 1996 the National Federation of Coffee Growers of Colombia, through the National Coffee Research Centre - CENICAFE, began to develop research into technologies that would reduce the harvesting costs.

The purpose of the present investigation was to know the dynamics of the harvest process, in such a way that it could serve as a basis for future mechanisation research. In addition, a manual technology for the selective detaching of fruit was proposed as a contribution to the optimisation of man-work relationships in coffee harvesting.

**METHODS AND MATERIALS**

This work was developed in three stages corresponding to movement study, ergonomics analysis and a field evaluation of the proposed method. From an initial group of 7 male individuals, 4 were selected to participate in this study, following field supervisor criteria for high, medium and low labour performance pickers. Colour blindness, physical endurance, agility and haemoglobin tests were performed on these individuals.

In the colour blindness test, a classification of paper figures of different colours was requested of the pickers. Their physical endurance was measured through the Cooper test, recording the metres travelled in 12 minutes of running in an open field. During the Cooper test a Polar TargetTM heart rate monitor was attached to a picker's thorax to register that person's heart rate at 1 minute intervals. Agility was measured via a reflex arch test by which the pickers were required to pick up as many red berries as they could in one minute, from a tray that contained as an equal number of red and green fruit and half that number of leaves. As a final qualification for the test, the number of red fruit that had been collected from the tray was recorded. The determination of haemoglobin levels was performed in a clinical laboratory.

**First stage**

The first stage of the movement study was carried out in La Catalina experimental station (Risaralda; 04°45' N.L.; 75°45' W.L.; 1.350 m.a.s.l.), during 10 work sessions of approximately 9 hours each. The observations were made in coffee plantations with slopes between 0 _ 70% and plant densities between 5,000 — 14,000 plants/ha.

Three daily observations, of 15 minutes each, were accomplished to determine the furrow movement patterns, and to establish the occurrence of each pattern among the pickers.

For the movement analysis associated with the tree, branches and hands, the picker activity on 10 randomly selected trees was recorded on a professional video camera (Panasonic AG-DP800HP) super VH5 format, to 30 frames per second. Through visualisation using a television monitor and video cassette recorder (Panasonic AG-DS850), at rates of 30 and 15 frames per second, the movements in the tree were identified, determining the sequence of displacements between tree strata, and making possible the definition of a displacement profile for every picker.

Picker movements in the branches were recorded at rates of 7.5 and 5 frames per second, establishing the kind of movements executed, which were classified according to the number of changes in hand direction through the branch. The variable for analysis was the percentage occurrence of each kind of movement.

For an analysis of hand movements, the group of micro motions or therbligs (Barnes, 1963) that compose the repetitive unit of the activity (Basic Harvest Cycle, BHC), at a rate of 5 frames per second was identified. Based on the execution of the BHC, the duration time of each therblig was determined at 1.2 frames per second (it was measured in thirtieths of a second). The therblig sequence was also determined. Based on the previous information, the time percentage of each therblig and the average speed of therbligs execution (number of therbligs/minute) were calculated. In total, 90 BHCs by picker were analysed.

The pickers’ body postures were identified in the field using a professional video camera and a photo camera.

The sequences for displacements between tree strata and therbligs were analysed through Kendall’s concordance test, at the level of 5%, to establish the concordance between pickers. The variables that involve a percentage score, were first characterised by descriptive statistics and later by the Duncan’s multiple range test, at a level of 5%, in order to establish differences between the pickers. For this last test, it was verified that the variables agreed with the statistical assumptions and where these assumptions were violated, mathematical transformations were applied, to verify those findings. The information analysis was made with SAS® software (6.12 version).

Four indicators were used, for a daily evaluation of the operative activity of each picker:

- efficiency (indicates how fast the process was made) was measured through the variable harvesting time per tree, with each record noting the kilograms of coffee collected per plant;
- effectiveness (indicates how well the process was made) was quantified through the percentage of mature coffee cherries detached from the tree;
- quality (indicates the characteristics of the collected coffee) was measured by the percentage of mature coffee harvested; and
ERGONOMICS AUSTRALIA

• Losses (indicates how much coffee was lost in the process) was evaluated through the percentage of fruit left on the ground. The fruit present on ground from the previous harvest was collected before beginning these tests in order to establish accurate losses from the current harvest.

Owing to the fact that the performance of pickers could depend on the initial amount of mature coffee on a tree, the kilograms of this kind of fruit available for harvesting by each picker on the day were calculated from a matter balance. These details were used to modify the variables related to the process efficiency and quality data. That is to say, the real picker’s performance could be known, independent of the amount of mature coffee that was available for harvesting. Subsequently, the Duncan’s multiple range test was applied, at the level of 5%, to establish differences between pickers.

Second Stage
In the ergonomics analysis that constituted the second stage of this research, each picker’s typical movements (movements in the furrow, tree, branches and hands) were related to their operative performance indicators (efficiency, effectiveness, quality and losses). Based on the results of this analysis, an improved method of manual harvesting was proposed which included the construction of a tongue-shaped accessory for the plastic basket used by the pickers during the process.

Third Stage
The third stage involved a field evaluation of the proposed method and was developed at Gigante experimental station (Huila; 02°20’ N.L; 75°31’ W.L; 1500 m.a.s.l.), after training the pickers for one week. The pickers worked for 10 sessions in diverse conditions of slopes, plant densities and plant age. During these sessions, the information about variables associated with the operative indicators was measured.

To establish symptoms of physical over-effort, the heart rate (beats per minute) of the pickers was measured at different hours of the day, using a Polar TargetTM monitor. With the collected data, the confidence intervals, at the level of 1%, were generated. The occurrence of physical over-effort was established on the basis of a heart rate limit of 85% of the maximum heart rate (MHR85).

RESULTS AND DISCUSSION
The results of the pickers’ aptitude tests (table 1), show that the four individuals met the physical endurance test (according to Grosser et al, 1989); were not colour-blind; and their haemoglobin levels were over 13.3 g/dl. Their agility oscillated between 117 and 154 successes per minute, which indicated a potential yield of between 12.5 and 16.4 kg/h that compared with the national average (10.6 kg/h; FEDERACAFE, s.n.f.). This result demonstrates that the selected individuals would be considered high-performance pickers.

Those results can be explained by the fact that the pickers were from the same zone, in which the differences in the nutritional diet, ethnic origin and work roles are not appreciable between individuals of the same sex. The negative results for the colour blindness test could be explained on the basis that colour-blindness only appears in 8% of the world population. In addition, a picker’s continued employment is dependent on the ability to differentiate the colours correctly, since red or yellow fruit are ready to be detached, while green fruit are immature and should not be detached.

Table 1. Results of the aptitude test by picker

<table>
<thead>
<tr>
<th>TEST</th>
<th>PICKER</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Physical endurance (m)</td>
<td>1850</td>
</tr>
<tr>
<td>Average heart rate for endurance test (beat/min)</td>
<td>168</td>
</tr>
<tr>
<td>Colour-blindness</td>
<td>Negative</td>
</tr>
<tr>
<td>Agility (successes/min)</td>
<td>154</td>
</tr>
<tr>
<td>Haemoglobin (g/dl)</td>
<td>15.0</td>
</tr>
</tbody>
</table>

In the development of the movement study (first stage), the field observations showed three patterns of furrow movements (figure 1). The results showed that in slopes between 23 — 70%, the most common movement pattern was “curls”, while in flat topography pickers moved more frequently in “stripes”. Only picker 2 preferred to move by “stripes” independent of the slope (table 2).

It is expected that in “curls” a picker makes a greater displacement than in “stripes”. However, in high slopes, when a picker moves by “curls” and carries out small and frequent rests while descending, they could experience a smaller energy cost (supported in Forcadas, 1978). In a displacement by “stripes” on a continuous rise, the rests are smaller, which could be associated with greater energy cost. It is presumed that in flat lands the smaller energy cost is associated with “stripes” movement because there is minor displacement. In this way, the observed results can be explained since people instinctively execute movements that represent smaller energy costs (Estrada, 2000).
Table 2. Percentage of occurrence of furrow movement pattern

<table>
<thead>
<tr>
<th>SLOPE</th>
<th>MOVEMENT</th>
<th>PATTERN</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 - 8.3%</td>
<td>Curls</td>
<td>1 2 3 4</td>
</tr>
<tr>
<td></td>
<td>Stripes</td>
<td>0 20 0 0</td>
</tr>
<tr>
<td></td>
<td>Stripes-Curls</td>
<td>20 0 0 0</td>
</tr>
<tr>
<td></td>
<td>Stripes-Serpentine</td>
<td>60 0 80 50</td>
</tr>
<tr>
<td>23 - 70%</td>
<td>Curls</td>
<td>66.7 33.3 66.7 50</td>
</tr>
<tr>
<td></td>
<td>Stripes</td>
<td>16.7 58.3 16.7 33.3</td>
</tr>
<tr>
<td></td>
<td>Stripes-Curls</td>
<td>8.3 0 8.3 16.7</td>
</tr>
<tr>
<td></td>
<td>Stripes-Serpentine</td>
<td>0 8.3 8.3 0</td>
</tr>
<tr>
<td></td>
<td>Curls-Serpentine</td>
<td>8.3 0 0 0</td>
</tr>
</tbody>
</table>

The Kendall’s concordance test to 5%, showed statistical concordance between pickers for the modal sequence of movements on the tree (figure 2). That is to say, a habit of arrival at the tree strata exists, and is influenced by the amount of fruit present. A well-ordered sequence could involve beginning the fruit detaching in the upper layer and continuing downwards to finish with the fruit collection on the ground. This is a single sense movement that does not present changes of direction and reduces the time that pickers invest in choosing the next branch to work on.

Figure 1. Pattern of furrow movement

Figure 2. Typical displacement sequence between tree stratum.
The repetitive unit of the hand movements (Basic Harvest Cycle, BHC; figure 4), begin when the empty hand is moved by the picker to find the fruits (MeF). Once it arrives at the fruit, the hand holds it (Ho) and subsequently detaches it (De) using the thumb (which applies the detaching force) and index finger (used as support for detaching). Later, it transports the detached material towards the centre of the hand palm, using the other fingers to create a space for temporary storage (TrPalm). The thumb and index finger then move towards the next fruit (Re) and continue making the previous four therbligs (harvest subcycles) between 3 and 8 times, until the hand temporary storage capacity is full. To end the BHC, the hand full of fruit is moved to the plastic basket that the pickers maintain adhered to their waist and, drop the fruit (MfDf). It is not usual for pickers to just let the fruit drop (Df) from the branches to the plastic basket, since to execute that therblig, the basket would need to be under the branch to catch the detached fruit.

The observations of fruit harvesting on branches showed twelve kinds of movement, which were classified according to the number of changes in hand direction (figure 3). The results indicate that the most common sequence is type A (from the trunk outwards). Differences in the percentage of occurrence of each movement by individual pickers are shown in Table 3. With a Type A sequence, the picker can have more control over branches, because they do not undergo buckling and, in addition, this would diminish the additional time needed to search and reach for the branches that lose contact with the hands—a common event when the picker makes type B movements. The remaining sequences (from type C to L) were observed for pickers 1, 2 and 4, in 24% of the branches analysed.

Figure 3. Movement pattern on the branches (upper viewer)

Table 3. Percentage of occurrence of movements type A and B on the branches

<table>
<thead>
<tr>
<th>PICKER</th>
<th>TYPE A</th>
<th>TYPE B</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean CV (%)</td>
<td>Mean CV (%)</td>
</tr>
<tr>
<td>1</td>
<td>63.35 bc 25.72</td>
<td>12.82 b* 15.79</td>
</tr>
<tr>
<td>2</td>
<td>72.71 b 8.73</td>
<td>8.45 b 112.07</td>
</tr>
<tr>
<td>3</td>
<td>100.0 a 0.00</td>
<td>0.0 -</td>
</tr>
<tr>
<td>4</td>
<td>46.43 c 53.85</td>
<td>47.62 a 7.07</td>
</tr>
</tbody>
</table>

* Averages without common letters imply statistical differences, according to Duncan’s test to 5%
CV = coefficient of variation.
The Kendall’s test to 5% showed statistical concordance between pickers for the BHC therbligs sequence. This result was similar for both hands. The BHC average duration oscillated between 2.9 and 6.7 seconds. The analysis made for the time percentage of each therblig, taking as a base the total BHC duration (table 4) did not show statistical differences between pickers for De. Pickers invest less than 10% of the BHC total time for detaching the fruit. This result indicates that the hand activity on the BHC is characterised by showing a low participation in therbligs that contribute intrinsically to fruit detaching.

Although Ho is done by a full-hook (more efficient than pressure maintenance; Barnes, 1972), its time percentage oscillated between 36 — 43%. This can be explained because the pickers alternate their hands to keep in contact with the branches, thus avoiding additional time fractions taken to reach fruit that escaped hand collection in the first instance.

The time percentages for therbligs MeF and MfDf were superior to that observed in De — a result that is explained by the fact that they end in precision micro tasks (localization and contact with fruit in the branch; and precision draining of the detached material to the basket) that additionally involve visual participation through a reflex arch. In fact, for pickers 1 and 3, who displayed the better results in the agility test, the participation percentages of therbligs MeF and MfDf are statistically inferior to that of the other pickers.

The analysis for TrPalm only showed differences between picker 2 and pickers 3 and 4. There were no differences for Re. The execution of this pair of therbligs denotes an independent operation of thumb and index finger, with respect to the other fingers. Whereas the little finger, ring and middle finger are in compression, the other two execute the subcycle of detaching and temporary storing, events that reduce the pickers’ agility during the fruit detaching.

The Duncan’s test did not detect differences between pickers for the speed in therbligs execution on the BHC (table 5). This result shows that possible differences in the pickers’ performance cannot to be explained by this variable.
Table 5.  
Mean and variation of the number of therbligs per minute (for both hands)

<table>
<thead>
<tr>
<th>PICKER</th>
<th>Speed (Therbligs/min)</th>
<th>Mean</th>
<th>CV (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>24.2 a</td>
<td>10.5</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>23.9 a</td>
<td>12.3</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>24.0 a</td>
<td>8.7</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>23.6 a</td>
<td>15.3</td>
<td></td>
</tr>
</tbody>
</table>

* Averages with a common letter imply statistical equality, according Duncan’s test to 5%.
CV = coefficient of variation.

The postures adopted by the pickers during their work were related to the slope of the land and the tree layer in which they detached the fruit (figure 5). It was observed that the posture shown in figure 5h (trunk flexion) represents a musculo-skeletal risk because the compression and shear stresses can be increased in the L5-S1 joint. Although they do not represent a greater musculo-skeletal risk, the postures shown in figures 5 e, f and g, can obstruct the pickers’ displacement because their incorporation in continuous walking requires more time than if the picker chose to send a leg forward. Risky positions on sloping land were not observed.

The plastic basket is the only tool used for coffee harvesting in Colombia. It allows loads of up to 11 kg of collected coffee and is attached to a picker’s waist by a woven strap of agave fibre (Agave sisalana), approximately 5 cm wide x 47 cm long.

The results of the pickers’ operative performance (table 6) showed that they invested, on average, between 3 and 4.3 minutes to detach less than 1.16 kg of coffee fruit per tree. The percentage of detached mature fruit stayed around 96.6%, showing that 3.4% of available fruit was not detached from the tree. The percentage of fruit on the ground was lower than 2.5%. The average percentage of harvested mature fruit was below 76%, a result that is explained by the fact that the over-mature, unripe and dry fruit were not considered, for this variable, although they were present in the collected fruit.

Figure 5. Typical picker postures.
The ergonomics analysis (second stage) showed that although picker 1 harvested half of the coffee of the second person, he had invested more than half of the time taken by picker 2, that is to say, the greater efficiency was observed for the second worker (table 6). In addition, all pickers were equally effective and their losses were statistically equal and less than 2.5%. The second picker harvested, on average, the greater proportion of mature fruit, which means that his performance represented the higher quality activity.

In general, picker 2 presented the best operative indicators, demonstrating that movements formed by displacements through the furrow in "stripes"; and type A movements in the branches; resulted in an HBC in which the sub-cycle takes a low percentage of time.

Table 6. Average and variation, per picker, of the variables associated with harvesting activity Indicators

<table>
<thead>
<tr>
<th>PICKERS</th>
<th>EFFICIENCY</th>
<th>EFFECTIVENESS</th>
<th>QUALITY</th>
<th>LOSSES**</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Coffee harvested per tree <em>(kg)</em></td>
<td>Harvesting time per tree* (min)</td>
<td>Percentage of mature fruits detached</td>
<td>Percentage of mature fruits harvested *</td>
</tr>
<tr>
<td></td>
<td>Mean SE</td>
<td>Mean SE</td>
<td>Mean CV (%)</td>
<td>Mean SE</td>
</tr>
<tr>
<td>1</td>
<td>0.61 a 0.109</td>
<td>3.00 a 0.181</td>
<td>95.9 a 2.49</td>
<td>74.2 bc 1.17</td>
</tr>
<tr>
<td>2</td>
<td>1.16 b 0.107</td>
<td>4.25 b 0.182</td>
<td>96.7 a 2.20</td>
<td>75.8 a 1.12</td>
</tr>
<tr>
<td>3</td>
<td>0.82 a 0.103</td>
<td>3.32 ab 0.181</td>
<td>97.0 a 1.89</td>
<td>71.6 c 1.08</td>
</tr>
<tr>
<td>4</td>
<td>0.73 a 0.153</td>
<td>3.66 ab 0.272</td>
<td>97.0 a 1.48</td>
<td>71.9 c 1.63</td>
</tr>
</tbody>
</table>

Averages without common letters imply statistical differences, in accordance with Duncan’s test to 5%.

SE = Standard error; CV = coefficient of variation.

* For the information analysis, these variables were corrected through the kilograms of mature fruits available to be collected (supply of the tree).

** For the statistical analysis the losses were transformed to X1/5

In response to these results, a method was developed using the following specifications:

1. Movement to proceed along the internal faces of trees in the furrow;
2. Sequence for each tree to involve picking from above downwards, taking the branches on alternated sides and finishing with the collection of fruit on the ground;
3. Movement in the branch to proceed from the trunk outwards;
4. Work posture to ensure that one leg stays forward, in such a way that greater stability is obtained during the work and total flexion of the trunk is avoided by kneeling with one leg to the front; and
5. Movement of the hands determined by an HBC of four therbligs (MeF -So - De - Df).

For the accomplishment of this new BHC, an accessory for the traditional plastic basket was designed and constructed. Its function was to capture and direct the detached fruit towards its interior (figure 6A). In recent work (Vélez, 2000) statistically equal operative results were observed between this accessory and a similar one, for which the dimensions had been calculated with anthropometric criteria. This new version also had a wider strap (figure 6B). The use of this modified design reduced the inconveniences reported by pickers in relation to their lower back at the moment of kneeling down during harvesting sessions.

The results of the field evaluation (third stage) showed that with the execution of the improved method, the pickers reduced losses (fruit on the ground) by 36.4%. The percentage of mature fruit collected (quality) and the percentage of detached mature fruit (effectiveness) were increased by 18.5 and 1.4%, respectively (table 7).
Table 7. Results of operative variables for both harvesting methods

<table>
<thead>
<tr>
<th>VARIABLE</th>
<th>TRADITIONAL METHOD</th>
<th>PROPOSED METHOD</th>
<th>Relative gain(%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Min</td>
<td>Max.</td>
<td>Mean</td>
</tr>
<tr>
<td>Losses</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Quality</td>
<td>50.00</td>
<td>84.5</td>
<td>73.5</td>
</tr>
<tr>
<td>Effectiveness</td>
<td>89.62</td>
<td>98.92</td>
<td>96.6</td>
</tr>
</tbody>
</table>

In respect of the efficiency evaluation, the harvesting time diminished between 15 and 36.8% in trees with an inferior load (supply of the tree) of 2.0 kg of mature fruit to harvest (table 8). For the trees with a superior load (with a relative frequency of 5.8%), the harvesting time with the improved method was higher than that with the traditional method. This can be explained by the fact that when the picker executes the traditional method, his hand movements for detaching fruit are massive (it is called a “milking” of the branches) and therefore more efficient.

Table 8. Harvesting time (minutes) and relative diminution, in accordance with the amount of fruit detached by both methods

<table>
<thead>
<tr>
<th>KILOGRAMS OF COFFEE AS COFFEE AVAILABLE FOR HARVESTING PER TREE</th>
<th>TRADITIONAL METHOD</th>
<th>PROPOSED METHOD</th>
<th>Relative diminution of the time (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Min.</td>
<td>Max.</td>
<td>Mean</td>
</tr>
<tr>
<td>Less than 0.5 kg</td>
<td>1.91</td>
<td>2.20</td>
<td>2.09</td>
</tr>
<tr>
<td>Between 0.5 and 1.0 kg</td>
<td>3.41</td>
<td>3.85</td>
<td>3.63</td>
</tr>
<tr>
<td>Between 1.0 and 1.5 kg</td>
<td>4.95</td>
<td>6.16</td>
<td>5.50</td>
</tr>
<tr>
<td>Between 1.5 and 2.0 kg</td>
<td>6.05</td>
<td>6.93</td>
<td>6.49</td>
</tr>
<tr>
<td>More than 2.0 kg</td>
<td>5.50</td>
<td>8.14</td>
<td>6.82</td>
</tr>
</tbody>
</table>

The confidence interval at 1% associated with the average heart rate (figure 7), showed that the pickers did not reach the CM85 (85% of the Maximum heart rate), although this value is below the heart rate average observed for the physical endurance test (table 1). This indicated that operative benefit from the method was not attributable to physical effort, but to the execution of more effective movements.

CONCLUSION

In Colombia it has been argued traditionally that “picking coffee does not have science”. This affirmation does not correspond to reality since, although it is certain that detaching fruit is an easy task, it is not a simple matter to co-ordinate the best operative results with the well-being of the picker. This erroneous traditional concept has been applied in many countries where agricultural labours are not valued and human factors do not have social protection.

As this investigation developed, some aspects that describe the man — work relationship in the coffee harvesting industry in Colombia could be identified. The research has shown promising results for the proposed harvesting system. It is possible that an increase of 36.8% in the harvesting process efficiency among Colombian pickers may not be so attractive that it justifies an immediate change of habit. Nevertheless, the optimisation of this process will require further studies, since the adoption of the methods outlined in this research (or some similar future technology) would seem to guarantee significant benefits for the picker and ultimately the employer.
Figure 7. Heart rate evolution during the field evaluation.

Picker 1

Picker 2

Picker 3

Picker 4

ACKNOWLEDGEMENTS

The accomplishment of this work had not been possible without the support of the Colombian Institute for the Development of Science and Technology - COLCIENCIAS and the National Federation of Coffee Growers of Colombia. The constant commentaries of Liliana Tenorio de Santaella, O. T., School of Human Rehabilitation of the University of Valle, and the recommendations of Omar Ariel Ortiz, MD, Institute of Social Insurance of Cauca, were valuable. The enthusiasm of the four pickers that participated in this study was also definitive, which allowed their movements to be observed, measured, questioned and evaluated, making possible the development of this research.
REFERENCES


FEDERACION NACIONAL DE CAFETEROS DE COLOMBIA; BOGOTÁ. Indicadores de rendimiento de la caficultura colombiana. Bogotá, Gerencia Técnica, FEDERACAFÉ, s. f. p 112.


Exploitation of Australian fishery resources is being managed primarily via seasonal and quota regulation. Given the reduced exposure due to seasonality restrictions, fishing industries employees experience an extremely high risk of fatal and permanent injury from their work. Aquaculture industries have emerged in recent time to hedge supply and demand issues while reducing some of the financial and injury risk associated with off-shore fishing practices.

Most aquaculture farming projects bring the natural resource to a location where it can be intensely farmed, however in doing so new occupational risks are created.

This paper examines ergonomic issues associated with on-board processing and harvesting of pearl oysters in NSW. The case study investigates cultural factors influencing equipment and process design, plant safety requirements and work tasks demands. The paper discusses solutions to task; equipment and environmental problems faced by on-board crew members and offers a risk management framework for improving ergonomics in the broader aquaculture industry.

INTRODUCTION

Generally, the off-shore fishing and marine harvest industry exposes its worker to high level of risk of injury or death. Transportation to the resource in itself presents considerable hazards associated with environmental, climatic and isolation conditions. Once at the resource, the harvesting and processing methods give rise to a variety of plant and equipment, climatic and musculo-skeletal hazards. Additionally, the nature of the work can present stress factors related to isolation, broken sleep and prolonged work hours.

Additionally, the over-exploitation of the fishery resources is recognized as a major threat to the industry. In Australia, exploitation is primarily managed via seasonal and catch quota regulation. By introducing these measures, the nation is able to maintain and develop its valuable reserves of fish, shellfish and other marine produce. However the approach does present several supply and demand problems for the industry. In recent time aquaculture industries have emerged to hedge supply and demand issues. The alternative marine production methods are inadvertently removing some, but not all of the workplace injury risk associated with traditional off-shore fishing and marine harvesting practices.

Most aquaculture farming projects bring the natural resource to a location where it is easily accessible and can be intensely farmed; however in doing so new occupational risks are created.

AQUACULTURE TECHNIQUES

Aquaculture technologies are evolving rapidly in response to increased interest, demand and research. The techniques are broadly classified as:

- On-shore Methods – including ponds, dams and tanks;
- Captive Still Water Methods – including estuarine cages, open-water net ponds and shellfish farming.

Popular aquaculture areas applying the on-shore method include farming of fish, prawn, crayfish and abalone. In this method, man-made reservoirs are used to breed and grow monoculture stock in controlled environments. The method increases the accessibility to the farm stock by land vehicle thus reducing many of the risks normally associated with off-shore marine harvesting.

Captive still water farming has been practiced for many years in the form of oyster, mussel and other food crustacean farming. In recent years very productive techniques have been introduced for maturing fish stock in either estuarine or bay located holding or growth nets. This paper also discusses captive still water farming of pearl oysters. While captive still water farming involves monoculture stock, the farming environment is restricted rather than controlled. Captive still water techniques generally require boat access (but may have pedestrian or pontoon access) to tender and farm the produce. On a smaller scale and therefore at a reduced risk boat accessibility presents some, but not all of the hazards associated with off-shore fishing. In comparison, the issue of accessibility to captive still water operations presents greater risk than on-shore methods, but both have significantly less risk than open water, off-shore marine harvesting.
CATEGORISATION OF AQUACULTURE HAZARDS

For the purpose of this paper, a hazard is defined as:

"An energy source with potential to do damage".

Table 1 presents a review of injury risk associated with general hazard associated with marine harvesting techniques. This analysis combines both aquaculture and marine harvesting techniques. Risk assessments have been ranked left to right indicating greatest to least injury risk potential.

<table>
<thead>
<tr>
<th>Hazard</th>
<th>Biomechanical</th>
<th>Radiation (Mainly Solar)</th>
<th>Climatic and Environmental</th>
<th>Mechanical</th>
<th>Biological</th>
<th>Psychological</th>
<th>Acoustic and Vibration</th>
<th>Stored Potential</th>
<th>Electrical</th>
<th>Chemical</th>
</tr>
</thead>
<tbody>
<tr>
<td>On-Shore</td>
<td>High</td>
<td>Mod-High</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
<td>Low-Mod</td>
<td>Low</td>
<td>Low</td>
</tr>
<tr>
<td>Captive</td>
<td>High</td>
<td>Mod-High</td>
<td>Mod-High</td>
<td>Mod</td>
<td>Low-Mod</td>
<td>Mod</td>
<td>Low-Mod</td>
<td>Low-Mod</td>
<td>Low</td>
<td>Low</td>
</tr>
<tr>
<td>Off-Shore</td>
<td>High</td>
<td>Mod-High</td>
<td>High</td>
<td>High</td>
<td>Mod-High</td>
<td>Mod-High</td>
<td>Mod</td>
<td>Low-Mod</td>
<td>Low</td>
<td>Low</td>
</tr>
<tr>
<td>Harvesting</td>
<td>High</td>
<td>Mod-High</td>
<td>High</td>
<td>High</td>
<td>Mod-High</td>
<td>Mod-High</td>
<td>Mod</td>
<td>Low-Mod</td>
<td>Low</td>
<td>Low</td>
</tr>
</tbody>
</table>

Risk Categories: Low, Moderate and High

Table 1. Ranked risk assessment by hazard category across three (3) marine farming and harvesting techniques.

Clearly, biomechanical hazard associated with manual handling or persons falling and striking presents as the dominant injury risk factor for all industry workers. Radiation almost exclusively solar radiation, leads to skin damage with long term potential for skin cancer. Climatic and environment hazards also feature with higher risk potential.

Other hazards such as mechanical, biological, psychological and acoustic/vibration present moderate risk potential. Lower levels of injury risk are associated with hazards such as stored potential, electrical and chemical.

While the analysis is not presented in this paper, the dominant fatality risk factor across the industry is associated with climatic and environment hazards.

AQUACULTURE CASE STUDY – CAPTIVE STILL WATER PEARL FARMING

Introduction

This case study examines ergonomic issues associated with on-board processing and harvesting of pearl oysters.

Definitions

- **Main Rope/Float Line/Backbone/String** means the surface suspension line from which oyster cages are tied.
- **Droppers** means rope (2.2 metre) for connecting sets of oyster cages with approximately 220 droppers per string.
- **Cages** means rope mesh net/bag (approx 0.3 m³) for containing the developing oysters. There are three (3) to five (5) cages per dropper.
- **Punt** means flat bottom service boat/tender.
- **End Float** means large (300 mm) floats designating end of main rope and anchors.
- **Intermediate Floats** means small floats (150 mm) for regulating depth of cages along the Main Rope.
- **Block Anchor** means concrete block anchor (20 kg.) for maintaining position of the Main Rope. Attached along length of Main Rope.
Dan Forth Main Anchor means anchor (80 kg.) for securing position of ends of Main Rope.

Rope Winch means an electric roller winch located on starboard bow.

Idler Roller means a non-powered roller located on the starboard stern.

Oyster shellfish are propagated and transferred to strings of (rope mesh) cages suspended from float lines in open water until they mature. Maintenance (and eventually harvesting) of the cages is performed from a service boat (punt) involving three to four employees.

The main work tasks involve hauling float lines and attached strings of cages from the water into the boat, followed by high pressure water cleaning, and then returning the cages to the water.

Task Analysis

Task Being Preferred:
Lifting float lines and pulling up baskets into punt for high pressure water cleaning.

Main Outboard Tasks:
1. Setting out consist of:
   - Lifting Main Rope to Rope Winch and Idle Roller.
   - Tie on Droppers.
   - Tie on Cages.
   - Lift and cleaning (defouling) Block Anchor lines.
   - Tie on Intermediate floats.
   - Casting off Main Rope from Rope Winch.

2. Bringing In Cages consists of:
   - Lifting Main Rope to Rope Winch and Idler Roller.
   - Lifting Droppers.
   - Removing Cages.
   - Lifting and cleaning Block Anchor Lines.

3. Maintaining Cages consists of:
   - Inspecting condition of cages.
   - Pressure (water) cleaning cages and content.
   - Stocking cages.
   - Repairing floats, cages, droppers.

Crew Details:
Standard recommended crew consist of four (4) employees (including the punt operator). On occasion three (3) employees may make up a crew; however this may significantly increase load sharing for manual lifting tasks.

Figure 1. Service punt at oyster lease

Figure 2. Hauling oyster cages over the side of the punt

Figure 3. Float Line crew
Shift Duration:
Work commences at 5.00 am with an expected completion time of 2-3.00 pm.

Rest Break Routine:
Stop for 10 – 15 minutes every half hour (coincides with checking and cleaning filter of pressure spray unit).

Work Environment Conditions:
Sea conditions at the oyster lease location may vary from flat to light choppy conditions. The punt is covered with open sides therefore the employees are generally shaded, but there is no wind protection. The nature of the work results in an amount of mud/slurry in the bottom of the punt, but the combination of good deck surfaces and safety boots negates the significance of this factor.

Personal Protective Equipment:
Gumboots, wet-weather gear, overalls gloves and hat are standard dress requirements for on-board work.

Mechanical Lifting Aids:
The punt is equipped with:
1. Rope winch for hauling punt along Main Rope.
2. Davit for lifting the float line.
3. Roller winch for hauling in float/droppers.

Identification of Hazards
The following hazards were identified in relation to the manual handling task associated with lifting the float line (unaided by the mechanical lifting equipment) and manually hauling in cages:

- Mass and resistance of Main Rope and components;
- Considerable and repetitive manual handling of Main Rope and components;
- Frequent forward stooping posture;
- The need to raise Main Rope 800 to 1000 mm from water to winch;
- Not always a full crew working on the punt;
- Five (5) cages per dropper (approximately 20 kg when wet/fowled);
- Fitness for duty of entire team;
- Inability to implement work rotation system;
- Solo Main Rope lifting in absence of team lifting requirement due to incapacity of crew members.
- Failure of mechanical lifting equipment (davit) for raising Main Rope to winch.

Risk Assessment
Given that maintaining oyster cages is a manual handling intensive and repetitious operation, the risk of musculo-skeletal injury to employees is ever present. From this risk assessment, increased probability and severity of injury is attributed primarily due to the mass, nature and frequency of manual handling work. These primary factors can be compounded further by:

A. Increased load in the form of five (5) cages per dropper.
B. Damage to and unserviceability of mechanical lifting aids.
C. Inability to perform team lifting requirement and rotation of crew between tasks.
D. Deep, forward stooping lifting posture.

Risk Management
The assessed high risk of injury associated with on-board manual handling work stimulated the organisation to take remedial action. The following short, medium and long-term options were developed in consultation with operations employees:

Short Term:
1. Reduce number of cages per dropper from five (5) to three (3).
2. Professionally assess fitness for duty (physical) of all current and future cage maintenance team workers (including supervisors).
3. Specify minimum crew size of four (4) for all cage maintenance work.
4. Initiate a procedure for team lifting (and cast-off) of Main Rope to Rope winch.
5. Provide training to all staff on main rope handling procedure.

Medium Term:
1. Replace damaged davit with more reliable/task designed lifting devices. Incorporate use of new davit in the main rope handling procedure and provide refresher training of all crew.
2. Consult with crew members to investigate better design of main rope lifting and haulage systems to minimise manual handling.
3. Periodically audit work method for manually handling main rope.

Long Term:
1. Automate main rope lifting and haulage method to eliminate need for manual handling.
2. Investigate alternative purpose built punt designs to facilitate reduced manual handling and greater efficiency.
3. Periodically review and assess manual handling risks associated with cage maintenance.

Conclusion

This paper has compared three marine harvesting techniques to identify and rank key risk factors. The result of the analysis suggests the highest risk of injury is linked to biomechanical hazards for offshore fishing, captive still water and on-shore aquaculture technologies.

Using standard risk management techniques, the author has presented a framework to effectively control and reduce the risk of manual handling related injury. This model has investigated factors influencing the work environment, process design, plant safety requirements and work tasks demands and has successfully demonstrated how to systematise analyze and solve problems onboard a service punt used in a captive still water pearl oyster lease operation.

The author concludes that the risk management framework applied has produced practical solutions to task, equipment and environmental problems faced by on-board crew members and it therefore has significant potential for improving ergonomics in the broader aquaculture industry.

Editorial Comment:

The photo quality in the above article is unsatisfactory as repeated requests failed to produce original prints. Would all potential contributors please note that digital images in a Word (or equivalent) file are inadequate for a good result in our upgraded publishing format. Both editor and publisher are grateful for the excellent co-operation by Juan Carlos Velez-Zape for the Columbian paper in this edition. E-mail communication has been frequent and efficient. SMG

Expressions of Interest — Website Editor

Expressions of interest are called, for an exciting new voluntary position — that of Website Editor. The website is up and running, but now needs a dedicated person to guide it through the next stage. This is a challenging role, with the successful applicant being able to have an impact on how we communicate with members and on promoting ergonomics and ergonomics solutions to the general public. The person who takes on this position will assist in shaping the future look of the Ergonomics Society.

We see the website as being a key tool in assisting the Ergonomics Society to meet its stated goals of:
1. Encouraging professional development
2. Increasing and improving membership services
3. Promoting ergonomics and ergonomists

It is envisaged that the Website Editor will be responsible for the strategic planning and accuracy of information on the Website. The Website Editor will be assisted by the Web Master who will have responsibility for the day-to-day inputting of data. The Website Editor will work closely with the Ergonomics Australia Editor, with the Web Master, with individual portfolio editors and with members of the Board.

The appointment will be for a 2-year period, with an option to continue. This is your chance to make a difference. Any queries can be directed to Kerry J ones at kjones@cantech.net.au.

Please send your expression of interest to the Ergonomics Society Secretary, Roxanne Egeskov at roxanne.egeskov@dir.qld.gov.au by 15th July 2002.

New On-line publication from Canada — HOT Topics

The Human Oriented Technology Laboratory at Carleton University is pleased to announce the launch of its online publication, HOT Topics!

HOT Topics is a monthly publication for academics, professionals, and students alike. The intention of this publication is to position Human Computer Interaction in a broad context, to consider the far reaching effects of technology on our lives in a variety of contexts. Our aim is to provide stimulating content, but also to create a forum for discussion.

In the first issue of HOT Topics we look into the various ways of organizing usability specialists in companies to best facilitate collaboration with professionals in other disciplines. The issue includes a research article on this topic, along with interviews with industry professionals.

Visit http://www.carleton.ca/hotlab/hottopics

Upcoming themes include information and communications technologies in developing countries, privacy issues and eGovernment. Subscribe to HOT Topics and let us bring you interesting articles and interviews every month!

Dr. Gitte Lindgaard
Professor and Chair, User-Centred Design
Department of Psychology
Carleton University, Ottawa, Canada
email: gitte_lindgaard@carleton.ca
http://www.carleton.ca/epc
IEA 2006 Congress

Ergonomists throughout the world are asked to give suggestions for a central theme of the congress. Contact:

TNO Work and Employment
P.O. Box 718
NL-2130 AS HOOFDDORP
Netherlands
tel. +31.23.554.9.524
fax +31.23.554.9.305
mobiel +31.629.57.4109
e-mail: e.koningsveld@arbeid.tno.nl

ESA Membership Benefits

The Ergonomics Society of Australia Inc. is essential to the viability and survival of the ergonomics/human factors profession and to its growth. Among other things, the ESA:

• Is the largest organization of ergonomics/human factors professionals in Australia and the southern hemisphere;
• Provides a multidisciplinary networking opportunity with professionals across all the domains that make up this rich discipline;
• Gives the discipline identity in science and professional practice;
• Provides opportunities for the exchange of scientific and professional practice information;
• Contributes to bringing its knowledge base to the attention of lawmakers, government, industry leaders and other decision makers.

The goals of the ESA are to:

• Encourage professional development;
• Increase and improve membership services;
• Promote ergonomics and ergonomists;
• Represent the interests of members to government, peak bodies, media and other organisations;
• Stimulate research, innovation and effective applications of ergonomics;
• Provide and assist communication systems between members of the Society; and
• Administer the affairs of the Society effectively.

ESA Benefits at a Glance

Ergonomics Australia
A peer-reviewed journal on important ergonomics/human factors research and issues.

EA – on line
A web-based expanded version of Ergonomics Australia.

Simplicity
A high quality publication available to members of the ESA’s Computer Human Interaction special interest group (CHISIG).

Membership Directory
A listing of ESA members, contacts and organisations

On-line Member Directory
A listing of ESA members and contact information.

Annual Conference
A national forum including keynotes, scientific papers, workshops, social events and other excellent opportunities for maintaining and expanding your network with colleagues.

Conference Proceedings
All Members receive a copy of the annual conference proceedings.

Web Site
Information about the discipline, the society, contact points, relevant links and services.

State Branches
A local network of colleagues, programs and events.

Special Interest Groups
Membership opportunities with groups that are concerned with the ergonomics/human factors aspects of specific application areas.

Branch Newsletters
Many of the State Branches distribute local information to members through a state-based newsletter.

ESA annual report
A consolidated report compiling a summary of reports from all the various functional components of the ESA that provides an overview of the ESA’s activities during the previous year.

Code of Practice
A document that sets out the minimum expectations of the ESA on the practice and conduct of its Members in order to protect clients, colleagues, the good name of the discipline and the good name of the ESA.

Post nominals
Certain levels of Membership are entitled to use specified post nominals to signify their membership level within the ESA.

Referral service
Members at the membership level of Certified Professional Ergonomist can opt in to the Society’s referral service for professional ergonomics/human factors consultancy work

Honours and Awards
A suite of honours and awards is available and regularly presented to eligible recipients, usually during the life of the annual conference.

Discounts
Discounts are available to Members on certain products and services e.g. annual conference.

AGM
The annual general meeting of the ESA, usually conducted during the life of the annual conference is an opportunity for Members to have an input into the administration of the professional association.
**ESA Board**
The Board of Directors is charged with the responsibility to oversee the effective management of the Society.

**Federal Office**
An office and staff to work with the ESA Board and to co-ordinate and manage the administrative “essentials” of maintaining an incorporated association.

**IEA membership**
The IEA is a federated association of the International Ergonomics Association. International links with international like-minded associations are maintained and relevant information distributed to Australian members.

**OSHROM Access - New ESA Membership Service**
The Ergonomics Society of Australia has joined the Australian OHS consortium for the purchase of a one-year subscription to OSHROM for all of its members. The database can be accessed via the web and members will receive by email the URL, user ID, and password. If you do not have email contact the General Secretariat with your membership details for the access information. Under the license, up to 8 members of the Ergonomics Society will be able to search the database at any one time. If that number is exceeded (which should not happen very often) you will get a message to that effect and you should try again after about 15 minutes. To minimise the likelihood of this happening, make sure you logoff from OSHROM when you have finished using it.

**OSHROM** contains six databases that can be searched separately or together. Five of the databases are bibliographic and index the occupational health and safety literature (journals, conference papers, reports and books) from around the world. Between them, they cover all OHS topics and there is excellent coverage of the ergonomics and human factors literature.

**CISDOC** is from the International Occupational Safety and Health Information Centre (CIS) of the International Labour Organisation (ILO) in Geneva, Switzerland. Indexes international OHS literature. Note that the NOHSC Library has the full text of most of what is indexed by CISDOC in the CISDOC collection (from 1973-1997 on microfiche and from 1998 onwards in pdf format)

**HSELINE** is from the Information Centre of the Health and Safety Executive (HSE) in the UK. It has a lot of UK content but the database also indexes journals from around the world including Journal of Occupational Health & Safety: Australia & New Zealand. This database has good coverage of the professional/trade literature as well as more scholarly journals. It indexes some material back to the beginning of the 1900’s.

**NIOSH/TC & NIOSHTIC-2** is from the National Institute for Occupational Safety and Health (NIOSH) Technical Information Center in the USA. NIOSH/TC indexes the scholarly literature up until the end of 1998. NIOSHTIC-2 covers only material and reports produced or funded by NIOSH. NIOSHTIC indexes some material back to the early 1900’s.

**RIOSH** Index is from the Ryerson Polytechnic University Library in Canada. It has good international coverage. The database also includes industrial relations material.

**The Medline OEM (occupational and environmental medicine)** subset is from the National Library of Medicine (NLM) in the USA. It has excellent coverage in the occupational medicine field, back to 1965.

The sixth database **MHIDAS** (Major Hazardous Incident Data and Summary) provides brief details of major hazardous incidents. It is produced by AEA Technology, on behalf of the HSE in the UK.

**How to search OSHROM**
Once you have logged in you will find excellent help information both through drop down boxes and via the help button at the top right hand corner of the screen. A print friendly manual or a one page Quick Reference Sheet are available via the help button.

**Setting up Alerts**
Once you have done a search that you are happy with you can set it up as an alert or SDI (Selective Dissemination of Information). This means that every time the databases are updated, your search will be run against the databases and you will be emailed any new records on your topic.

The NOHSC Library staff have many years experience in searching OSHROM and would be happy to help the novice searchers.

Julie Hill  
NOHSC  
Contact Julie Hill on 02 6279 1161  
(or Thomas Stoddart on 02 6279 1163)  
(thomas.stoddart@nohsc.gov.au.)

**Additional Databases Access**
The Ergonomics Society has taken up this opportunity to join the OHSROM Consortium as a cost efficient ready access to searching services for its members. The ESA Board recognises that the database has an OH&S focus and as such has limits for the broader application of ergonomics and the needs of all of our members. The ESA Board is committed to pursuing additional services to provide access to databases that meet our members needs and as such are currently investigating information on access to “Ergonomics Abstracts” and other suitable databases to supplement the OSHROM service.

I encourage you all to consider using this service as part of your daily practice. The flexibility of direct online and 24 hour access is a major benefit to our members.

Roxanne Egeskov  
General Secretary

**Clunies Ross National Science & Technology Award 2003**
Nominations are now open for the Clunies Ross National Science & Technology Award 2003. Since 1991 this Award has recognised and honoured 67 people for their successful application of science and technology for the economic, social or environmental benefit of Australia. An award nomination provides an opportunity to reward and celebrate Australia’s outstanding scientific achievements.
The closing date for nominations is Friday 26 July 2002 and the winners will be announced publicly at the presentation ceremony dinner in March 2003.

Nomination forms and selection criteria are available at www.cluniesross.org.au

Additional information can be obtained from Award Secretary, Mary Bolger on (03) 9854 6266.

Distance Learning Postgraduate Programs in Human Factors

Exciting new distance learning programs have been developed by the University of Queensland in response to strong demand from industry and government for human factors professionals. Through collaborative links with a number of leading Australian universities UQ have developed a new suite of post-graduate programs, up to Masters level. The programs offer flexible delivery to appeal to both full and part-time students from Australia and overseas.

For program information please contact:
Key Centre for Human Factors and Applied Cognitive Psychology
Telephone: (07) 3365-6076
Email: masters@humanfactors.uq.edu.au
Website: http://www.humanfactors.uq.edu.au/student/distance

Key Centre’s Winter School 2002.

1. The Winter School 2002 will be held in an attractive seminar room setting at Emmanuel College at Univ. of Queensland.

2. We're happy to announce that our guest speaker this year is Professor Erik Hollnagel, from University of Linkoping. A brief bio and links to his website are on the Winter School 2002 home page at http://www.humanfactors.uq.edu.au/courses/winterschool2002.html.

3. The dates for the Winter School 2002 have been shifted slightly to Tues 23, Wedn 24, and Thurs 25 July to accommodate Professor Hollnagel’s busy international schedule (dates previously were 22-24 July).

4. Website with all details about location, abstract submissions, costs, etc., is at http://www.humanfactors.uq.edu.au/courses/winterschool2002.html. The website will be continuously updated as needed.

5. Accommodation information will soon be added to website but Jenny Greder (KC administrator at administrator@humanfactors.uq.edu.au) can provide initial information.

So...put the Winter School 2002 website on your favourites list and we look forward to seeing you at UQ!

Penelope Sanderson, PhD
Professor of Cognitive Engineering and Human Factors
ARC Key Centre for Human Factors and Applied Cognitive Psychology
McElwain Building University of Queensland,
QLD 4072 Australia

Tel: +61 (0)7 3365-6778 or -6076
Fax: +61 (0)7 3365-6171
Mobile: +61 (0)407 107 707
Email: psanderson@psy.uq.edu.au

Online registration and payment details are now available for CybErg’2002 at the following website address:
http://cyberg.wits.ac.za/registrat.html

Please register and pay your registration amount as soon as possible to ensure that you get the early-bird registration rate. At US$75 CybErg’2002 is still one of the cheapest international quality ergonomics conferences. In addition, we are able to make reduced registration rates available to the following groups of people:

- Participants from Industrially Developing Countries (contact the conference chair if you wish to know whether you qualify).
- Full-time registered students (proof of registration required)
- Participants that are also concurrently registered for the HFES2002 Annual Meeting (proof of registration required)

The number of abstracts that we received was overwhelming, but each of the abstracts submitted has been peer-reviewed by at least two members of the International Scientific Advisory Committee. We unfortunately had to turn down quite a number of abstracts either because of quality or because they did not meet the aims of this conference. There will be more than 60 papers and four symposia sessions from “presenters” from more than 20 different countries. We are expecting that the final registration numbers should see delegates from more than 27 different countries.
New Members Admitted Recently

WA
Lisa Hart (nee Pavone)
Worklink Occupational Health & Rehabilitation Service
939 Wellington Street
WEST PERTH WA 6005
Member
Christopher Coutinho
6 Lawsons Road
HENLEY BROOK WA 6055
Member

QLD
Kym Jones
14 Kate Street
TOOWONG QLD 4066
Member
Maria Thornton
1/20 Broughton Road
KEDRON QLD 4031
Affiliate
Tony Johnston
27 Nardie Street
EIGHT MILE PLAINS QLD 4113
Member

NSW
Cliff Carrasco
34 Kanangra Crescent
RUSE NSW 2560
Upgrade to professional
Margaret Gibson
PO Box 139
SPIT JUNCTION NSW 2088
Member
Meagan Kingham
AGL Health Centre
Level 10, II Pacific Highway
NORTH SYDNEY NSW 2060
Affiliate
Virginia Pascal
28 Cambridge Street
ENMORE NSW 2042
Member

VIC
Theodore Kanellos
PO Box 84
BRIGHTON VIC 3186
Member
Stephen Bartram
3 Bisinella Crt
LEOPOLD Vic 3224
Member

ACT
Bill Green
University of Canberra
Upgrade to professional
Conference Calendar

2002

1 - 30 September 2002
3rd Cyberg Conference — Ergonomics for Human & Community Development

For updates and further details:
http://www.wits.ac.za/fac/arts/psychology/Prelim.html
Andrew Thatcher (Conference Organiser)
01Bail@muse.wits.ac.za

30 September — 4 October 2002
46th HFES Annual Meeting — Bridging Fundamentals and New Opportunities

Venue: Baltimore Marriott Waterfront Hotel, Baltimore, Maryland, USA

Important Note: New location and Dates (Previously 23-27 September in Pittsburgh)

Contact: HFES
PO box 1369, Santa Monica, CA 90406-1369 USA
Phone: +1 310 394 1811
Fax: +1 310 394 2410
lois@hfes.org, http://hfes.org

14 — 17 October 2002
11th National Congress of the Indonesian Physiological Society and the 13th National Seminar on Physiology

Venue: Grand Bali Beach Hotel, one of the five star hotels in Bali, located on the beach at Sanur, Indonesia.

Contact: Adnyana Manuaba
adman@denpasar.wasantara.net.id

27 — 30 October 2002
International Federation on Ageing - 6th Global Conference Maturity Matters

Perth, Western Australia
Host - Disability Service Commission Universal Design Network
Sponsored - Department for Planning and Infrastructure

For more information contact:
Pip Daly Smith
pipds@dsc.wa.gov.au
Tel: 61 08 9426 9301
Fax: 61 08 9481 5223

14-15 November 2002
Putting Research to Work
11th Conference of the New Zealand Ergonomics Society

Wellington, New Zealand
Keynotes are Dr. Brian Peacock and Dr. Lynn McAtamney (now Lynn Barson). The theme “Putting research to work” is intended to encourage practitioners to present well-researched work, and academics to present work with a practical application. We’ve put a Call for Papers brochure on the NZES website (www.ergonomics.org.nz) which gives a little more detail, costs & the like.

Contact:
David Tappin
President NZES
david.tappin@cohf.e.co.nz

25 - 27 November 2002
38th ESA Conference — Human Factors 2002 (HF 2002)

Design for the whole person: integrating physical, cognitive & social aspects.

Venue: Sofitel Hotel, Melbourne, Victoria, Australia.
This is the first joint conference of the Ergonomics Society of Australia and the Computer Human Interaction Special Interest Group. For details about HF2002 please visit www.iceaustralia.com/HF2002 where Guidelines for Papers and Calls for Expressions of Interest are being added to site updates.

Contact:
Sara Hill
Event Co-ordinator
International Conferences & Events (ICE Aust. Pty Ltd)
178 Princes Hwy, Sylvania, Sydney, NSW, 2224, AUSTRALIA
Phone: +612 9544 9134
Fax: +612 9522 4447
E: sara@iceaustralia.com

2003

IEA Congress 2003 Seoul, Korea

The 15th Triennial Congress of the International Ergonomics Association, Seoul, Korea, 2003, will offer the exciting opportunity to discover the wonder of Korean tradition and culture. Referred to as the hub of Korean politics and economy, Seoul is international city, yet uniquely Korean as well. Blending her 5,000-year-old history with the cutting edge in technological and economic progress makes Seoul an exciting international city and popular tourist destination.

The Congress welcomes proposals for paper presentations, panel sessions, multiple-session international symposia, demonstrations, single-session symposia, poster sessions, debates, research/review/case study papers, colloquia, and workshops. Deadline for abstracts will be announced later. Contributions are invited in any of the subject areas listed below or in other related areas. Paper submissions are invited in all areas of ergonomics.

Please send all inquiries to:
Secretariat of IEA 2003
#37-12, 6F, Nonhyun Bldg.
J amwon-dong, Seocho-gu Seoul, Korea 137-030
Tel) 82-2-3446-2451
Fax) 82-2-3446-2465
E-mail: papers@iea2003.org
Information for Contributors

Editor
Dr Shirleyann M Gibbs
Gibbs + Associates Pty Ltd
25 Melaleuca Drive St Ives NSW 2075 Australia
Tel: +612 9983 9855 Fax: +612 9402 5295
E-mail: shanng@optushome.com.au

The deadline for issues in 2002:

- March edition = February 1
- June edition = May 1
- September edition = August 1
- December edition = November 1

Contributions
Contributions to Ergonomics Australia are always welcomed and encouraged. The activities, achievements, experiences, views and opinions of Members are always of interest. These can be in the form of letters, notices, notes, commentaries and articles.

The preferred form of submissions is via e-mail, either in the body of a message (short notices), or as an attachment (articles/letters). Files may also be mailed on floppy disc or Zip disc. Microsoft Word or Corel WordPerfect are the preferred formats (the editor cannot transcribe MacIntosh files that are not in IBM type format.) Hand written or hard copy submissions will only be accepted in exceptional circumstances.

Commencing from March 2002, all articles will be subject to a referee panel prior to publication. This will require authors to consider the necessary time to be taken in distribution to referees, review period, and reply to an author for final copy prior to publication. The preferred draft format for articles will be similar to that issued for ESA Conference papers 2001 and details will be included in future editions. Essentially it will involve providing:

- Abstract
- Keywords
- Introduction
- Methodology
- Results
- Discussion
- Conclusion
- References (Harvard system)

Text should be 1.5 spacing to allow easy corrections / suggestions to be inserted by the referee.

Our publisher, Acute Image, will handle the final layout format.

Any inquiries about contributions should be directed in the first instance to the Editor.
Information for Advertisers

Inquiries
All advertising enquiries should be directed to the Federal Office of the Society.

Contact:
Mrs Christine Stone
Tel: 02 6242 1951   Fax: 02 6241 2554
E-mail secretariat@ergonomics.org.au
9am - 1pm Monday to Thursday
9am - 12pm Friday

Size
The finished page size of the Journal is A4 (210mm x 297mm)
Copy Printed column sizes: 165mm x 225mm (double)
80mm x 225mm (single).

Advertising Copy
Must be camera ready or on Disc and must arrive at the ESA Federal Office by the Copy Deadline Submission Date for the edition(s) in question.
A professional Advertising design service is available for producing camera ready copy if required. For further inquiries regarding this service contact:
Mr Goro Jankulovski, Acute Communications
Phone: +613 9381 9696  Mobile 0414 605 414
Email: goro@acuteimage.com.au

Rates For Advertising
These rates are inclusive of GST

<table>
<thead>
<tr>
<th></th>
<th>Full page</th>
<th>1/2 page</th>
<th>1/4 page</th>
<th>1/8 page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single issue</td>
<td>$330</td>
<td>$165</td>
<td>$82.50</td>
<td>$41.80</td>
</tr>
<tr>
<td>2 issues</td>
<td>$297</td>
<td>$148.50</td>
<td>$74.80</td>
<td>$37.40</td>
</tr>
<tr>
<td>3 issues</td>
<td>$264</td>
<td>$132</td>
<td>$66</td>
<td>$33</td>
</tr>
<tr>
<td>4 or more</td>
<td>$231</td>
<td>$115.50</td>
<td>$58.30</td>
<td>$29.70</td>
</tr>
</tbody>
</table>

Enclosures
Pre-printed enclosures (leaflets, brochures) etc are welcome for inclusion with the Journal.
Enclosures should be pre-folded to fit inside the finished Journal.

Rates for enclosures:
Enclosure not requiring folding $412.50
Enclosure requiring folding $462.00

These rates may increase if the enclosure weighs more than the equivalent of 2 standard weight A4 pages. These rates are inclusive of GST

700 copies should be sent to arrive at the ESA Federal Office by the Copy Deadline Submission Date for the Edition in question.

Address For Mailing Copy and/or Enclosures
ESA Federal Office
Creeda Business Centre
Bradfield Street
DOWNER ACT 2602

Advertising Copy and Enclosure Submission Deadlines For 2002
Advertising copy and enclosure submission deadlines for 2002 are the same as for Contributions — 1st of month prior to publication. Journal is published quarterly in March, June, September and December.

Circulation
The Quarterly Journal will be received by approximately 700 professionals in Australia and overseas working in the areas of ergonomics, occupational health and safety, and design.

Ergonomics Australia
On-Line (EAOL)
Advertising and sponsorship opportunities also exist in the electronic version of this Journal (EAOL) which is managed by Dr Robin Burgess-Limerick at Department of Human Movement at Queensland University. It is downloaded by more than 100 Australian and International readers each week.

To view EAOL: http://www.uq.edu.au

Caveats
The views expressed in the Journal are those of the individual authors and contributors and are not necessarily those of the Society.

The ESA Inc reserves the right to refuse any advertising inconsistent with the Aims and Objectives of the Society and Journal Editorial Policy.

The appearance of an advertisement in the Journal does not imply endorsement by the Society of the product and or service advertised.

The Society takes no responsibility for products or services advertised therein.

Editor
Dr Shirleyann M Gibbs
Gibbs + Associates Pty Ltd
25 Melaleuca Drive St Ives NSW 2075 Australia
Tel: +612 9983 9855  Fax: +612 9402 5295
E-mail: shanng@optushome.com.au