Human Factors and Ergonomics Society

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Human Factors and Energy Use

By Thomas F. Sanquist

The recent and rapid increase in energy prices worldwide and the increasing concern over climate change have led to greater awareness of our need to make fundamental changes in our patterns of consumption. Recent data suggest that in the United States, people are driving less and using mass transit more. In this article I discuss the prospects for engaging the concepts, principles, and tools of the human factors/ergonomics (HF/E) discipline to make it easier for people to understand and implement behavioral changes that save energy.

Although it is fairly obvious that energy consumption is based largely in human behavior, the degree to which individuals can alter their energy use is much less clear. The "big picture" of energy consumption is portrayed by demand projections in rapidly developing economies – the drive to replicate U.S. standards of living is contributing to the building of more coal-based electricity-generating plants, and many more privately owned vehicles are on the road. In the United States there have been corresponding increases in the number of privately owned vehicles in the past 30 years, and some projections suggest that overall demand will outpace generating capacity in the near future.

These infrastructure changes are part of a complex socio-economic-technical system that behavioral science researchers have analyzed into the "lifestyle" components of energy consumption (Wilson & Dowlatabadi, 2007). Combining knowledge of lifestyle-based energy consumption with new developments in technology and information systems provides a natural opportunity for those of us in the HF/E discipline to contribute to reducing energy use. This complex topic can tap the entire range of human factors, from the macroergonomics of energy utilization to the cognitive engineering of household metering systems and controllers.

Social Aspects of Energy Demand and Potential Household Savings

Energy consumption is based on the benefits it provides to people, such as the activities that enable what we have come to think of as routine domestic and work life. This includes shelter and protection from the elements (heating and cooling), sustenance (food refrigeration and preparation), cleanliness (hot water for bathing, clothes washing, etc.) and getting to and from work (transportation).

Viewed from this perspective, there are many constraints on individual choice, such as the availability of affordable housing in proximity to the workplace, climate in the geographical area of residence, and generally modern standards for comfort and mobility. Technological developments can lead to normative changes over time, as shown by the case of air-conditioning (AC): Between 1962 and 2001, the percentage of homes using AC rose from 12% to 74%. In that same period, home design practices changed substantially, with the elimination of construction features such as verandas and eaves that could provide passive cooling. Overall, space conditioning (heating and cooling) accounts for 25% of in-home energy consumption (approximately 10% of total U.S. energy consumption; Gardner & Stern, 2008).

Early research in this area suggested that substantial decreases in consumption in the United States could be achieved without adversely affecting lifestyle (Mazur & Rosa, 1974). Recent data indicate that although the energy cost per dollar of Gross Domestic Product has decreased substantially because of industrial efficiencies, overall energy consumption continues to climb (Energy Information Administration, 2007). This can be attributed in part to domestic use, which has increased by 6% since 2000 (Gardner & Stern, 2008).

Other indicators of the increase in power consumption in the home are that the typical American household has 27 separate devices that are always on, and the newest generation of television displays consumes substantially more power than its predecessors. One analysis suggests that the energy saved by replacing all household lightbulbs with fluorescent bulbs is offset by a typical level of viewing on a large-screen, high-resolution television. The Energy Star ratings of these devices do not accurately reflect their power use (Smith, 2007).

Human factors applications in the general area of social patterns of energy use would include the design and implementation of activity analysis tools to characterize energy use at a more granular level to define clusters of energy-consuming activities, the design of workplace-household transportation alternatives, and the design of intervention aids such as guidelines and checklists to assist people with altering their consumption.

Effective Energy-Saving Actions

Domestic consumption, in terms of both transportation and in-home energy use, is a good potential target for energy savings. The challenge is to organize and present information in ways that consumers can understand and use and to provide feedback and other means of reinforcement to maintain behavior change.

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(continued from page 1)

Gardner and Stern (2008) conducted an analysis of energy consumption, the findings of which suggest that simply by changing the selection and use of various household and vehicle technologies, households can reduce energy consumption by up to 30%; that is, 11% of total U.S. consumption. The authors point out that despite such potential savings, there is very little well-organized and easy-to-understand information available to help people select and implement these changes. The basic problem is that "households lack accurate and actionable information on how best to achieve potential energy savings" (p. 14). This is largely attributable to lack of organization on the part of information sources, such as energy agency Web sites or guidebooks, lack of specificity in descriptions of potential actions, failure to rank potential actions in standard metrics, general concern on the part of the public that change involves sacrifice, and a political climate that de-emphasizes conservation and efficiency.

The principal types of action for reducing consumption fall into the classes of *curtailment* and *efficiency*. The former involves actual reduction in the frequency or duration of specific activities, such as single-car commuting. The latter involves one-time actions, such as installing improved home insulation or purchasing new-model, energy-efficient appliances that consume less power. Curtailment involves repeated activity that produces relatively smaller energy reductions (e.g., up to 4.2% for switching to a carpool) versus one-time efficiency actions involving greater expense that produce relatively larger energy reductions (e.g., 13.5% for a more fuel-efficient car).

People tend to associate energy use reduction with curtailment and lack readily available quantitative comparisons of various kinds of energy reduction activities. Gardner and Stern (2008) provided this information in a "short list" that ranks both curtailment and efficiency actions, which can serve as a guide to selection and implementation. The table at right illustrates selected actions from this short list and shows that combining curtailment actions in the near term can result in more energy savings than higher-cost, one-time actions. The more detailed list provides a breakdown of specific categories that can help consumers decide what actions are feasible for them.

Selected Curtailment and Efficiency Actions That Can Be Taken by Households to Save Energy.

Low-Cost Immediate Actions	**Energy Saved (%)**
Transportation: carpooling, vehicle maintenance, good driving habits, combining trips, correct tire pressure	Up to 17.6
In home: Install fluorescent bulbs, heat to 68 (day) and 65 (night); cool to 78; caulk & weatherstrip	Up to 9.9
Total potential savings	27.5
Higher-Cost, Longer-Term Actions	**Energy Saved (%)**
Buy more fuel-efficient automobile (30.7 MPG vs. 20 MPG)	13.5
Space conditioning – install/upgrade attic insulation/ventilation	Up to 7.0
Total potential savings	20.5

Adapted from Gardner and Stern, 2008. The full list is available at http://www.beldref.org/GardnerStern.pdf

Although the content and form of information from lists such as this provide an excellent resource, it has been found in previous research that attitude, information, and motivation are insufficient to produce enduring behavior change (McKenzie-Mohr, 2000). Implementation of certain actions, such as carpooling, requires people to further assess the availability of ride-sharing, the impact on arrival and departure times, and flexibility for transportation during the work day, among other things. Successful ride-sharing and vanpool programs, for example, provide extensive support in these areas, including ride-matching Web sites.

Facilitating the implementation of energy reduction behaviors appears to be highly amenable to HF/E analysis techniques, particularly task-analytic-based assessment of the requirements for certain curtailment activities such as carpooling or changes in driving behavior. Further, HF/E-based information design and presentation could facilitate a better understanding on the part of consumers regarding efficiency behaviors in such areas as gradual replacement of lightbulbs with efficient fluorescent devices, where to recycle used bulbs, and the trade-offs between purchasing a fuel-efficient vehicle versus reducing miles driven on a less efficient vehicle and improving its performance through regular maintenance.

The trade-off in energy cost for producing new vehicles and disposing of old ones is a product life cycle consideration that can be demystified with decision aids. Key elements of this approach are the use of standard HF/E concepts and tools to identify barriers to implementing energy reduction behaviors, providing appropriate support to overcome those barriers, and developing feedback and reinforcement mechanisms such as periodic reports or displays indicating how much less energy is being used and how much money is being saved.

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Demand-Side Management: Smart Grids, Smart Metering, and Information Delivery

An alternative approach to implementing specific individual energy use reduction actions in the household can be seen in the power industry concept of demand-side management. This refers to a power grid architecture and associated technologies that can more effectively manage demands on generating capacity through intelligent automation and variable energy pricing at the end-user level. These types of systems have been in place for large industrial users for some time, and progress is being made toward providing real-time cost savings to consumers through the use of smart metering systems (Hammerstrom et al., 2007).

A recent field study of smart metering systems by the U.S. Department of Energy illustrates that consumers can reduce their energy use on the basis of price signals provided by intelligent automation in the home. Consumers were provided with the ability to select water heater and space-conditioning thermostat settings on the basis of comfort versus economy. Compared with control groups in fixed-rate or no-incentive conditions, the smart-meter group significantly reduced electricity consumption and saved money in the process. The automation provided to consumers was more sophisticated than a typical time-of-day setback thermostat and involved comfort/economy setting overrides and device interactions with market pricing via Internet connections (Hammerstrom et al., 2007).

Utility companies are making substantial investments in this area in several parts of the country where severe power shortages have occurred in the recent past, such as southern California. The vision of technology developers is that eventually home power systems will provide device utilization information through centralized user interfaces available on home computers or television screens (Fitzgerald, 2008).

Although there are many initial barriers to implementing this technology based on existing infrastructure (e.g., centralizing power information in most existing houses is not straightforward), there are obvious applications for the human factors discipline in this domain. These include collaboration with energy companies to develop a "cognitive architecture" of power consumption that is meaningful to consumers, activity analyses to determine more precisely the behavioral basis of energy use peaks and valleys, and smart meter user interface design – an area that is now primarily performed by electrical engineers. Properly designed, these devices can provide real-time feedback on consumption and economy.

Outlook and Prospects

In this article I have outlined a number of areas in which human factors engineering, broadly construed, can contribute to reducing energy use. These include social and organizational analyses of energy-consuming activities, the development of effective information and guidelines for consumers, the design of intelligent metering user interfaces, and, more generally, facilitating the development of social/behavioral infrastructure and reinforcements to support reduction in energy use.

Being the largest single consumer, the United States is in a particularly good position to lead in worldwide efforts reduce energy use. As pointed out by Gardner and Stern (2008), the potential savings available through simple curtailment and efficiency actions have been known for at least 30 years. However, the return to cheaper oil in the 1980s and '90s removed the principal motivation for reducing energy use, virtually eliminated social science research in this area, and encouraged the development of energy-inefficient products. More recently, congressional hearings have emphasized the need for renewed focus of the social and behavioral sciences in response to the energy challenge (Committee on Science and Technology, 2007). It is important that those of us in the HF/E discipline respond to this challenge.

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Erratum

In the October issue, the invitation for applications for Fellow included a call for Honorary Fellow applications. The Executive Council voted in September to discontinue the Honorary Fellow designation. The Fellow Application Package is available on the Fellows page of the HFES Web site (http://www.hfes.org/web/Awards&Fellows/fellows.html).

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Technical Groups

PDTG Awards Go to Motorola and Sage Software

Chandra Nair (center) wears computer/scanner as he, Jaeho Choi (left), and Eric Johnson (right), receive award.

The HFES Product Design Technical Group (PDTG) presented two awards at the 52nd HFES Annual Meeting in New York City to winners of its competition for innovative and user-centered approaches to human factors and industrial design. At a well-attended PDTG session, the award went to Motorola for its WT4000 Wearable Computer, an arm-mounted mobile computer/scanner used by warehouse workers to pick and handle orders. Human Factors Lead Chandra Nair, along with team members Jaeho Choi and Eric Johnson, accepted the award for Motorola's Innovation and Design Group. Chandra gave a comprehensive presentation of the human factors and industrial design features of the product and the process used to achieve them.

An Honorable Mention was given to the Sage Software User-Centered Design and Usability Team for its Peachtree Accounting 2007 application. This application enables people to perform a wide variety of complex accounting and financial management tasks. Accepting the award was Team Leader Paul Sherman.

The award committee of Dianne McMullin and Stan Caplan received diverse product nominations. A panel of six judges evaluated nominations based on their product design (functional obviousness, ease of operation, and creativity) and the user research methodology involved during concept development, design, and evaluation.

Thanks go to PDTG members David Aurelio, Hugh McLoone, Beth McGough, Karen Piegorsch, Tonya Smith-Jackson, and Michael Tschirhart, who diligently evaluated all of the nominations.

Previous winners of the award and other PDTG information can be found at http://cptg.hfes.org/. PDTG invites you to become a member of this growing group, currently at 543 members, and to participate in its activities.

Look for a call for nominations for the 8th Annual User-Centered Product Design Award in the January issue of the *HFES Bulletin* and the PDTG Web site. Send inquiries to Dianne McMullin (dianne.l.mcmullin@boeing.com) or Stan Caplan (scaplan@usabilityassociates.com).

Outreach

HFES Releases Interview With Voting Systems Experts

On October 27, HFES published an article on the Society's Web site highlighting issues regarding voting system and ballot design from five HF/E experts in this area. Accompanying the article is a press release, which may be viewed at hfes.org.

Conceived and executed by *Human Factors* Editor Nancy Cooke, the article features an interview with Mike Byrne, Tiffany Jastrzembski, Douglas W. Jones, Bill Killam, and Whitney Quesenbery. They discuss problems that arose in the 2000 and 2004 presidential elections and work they're carrying out to help avoid similar problems in future elections.

The article is freely available at http://www.hfes.org/web/HFESNews/HFE-ExpertsonVotingSystems.pdf.

Annual Meeting

Preliminary Call for Proposals: 53rd Annual Meeting

October 19–23, 2009, San Antonio, Texas USA

HFES invites all members and nonmembers to submit proposals for the 53rd Annual Meeting, which will take place October 19–23, 2009, at the Grand Hyatt San Antonio. Formats include lectures, discussion panels, invited symposia (in which a chair invites a series of papers on a single topic), demonstrations, posters, and hands-on workshops, as well as innovative formats: case studies, debates, demonstrations, competitive product designs, new methodologies, on-site experiments, and so on.

The tentative deadline for submitting any type of proposal is February 23, 2009. A fully detailed call for proposals will be available at the HFES Web site in December describing details such as the proposal length and other guidelines for submission and copyright.

All submissions will be uploaded to a Web site. (The URL will be provided in the instructions.) An e-mail address is required to submit a proposal because all correspondence regarding your submission will be sent via e-mail.

Papers that have been published previously or presented at another professional meeting may not be submitted. All research and analyses described in your proposal must be complete at the time the proposal is submitted. Program chairs may reject, with or without review, papers that do not present completed work. The sole exception to this policy is for student work submitted for consideration in the Student Forum track, in which case the proposer may report on work in progress.

If you know of nonmembers who might be interested in submitting a proposal – particularly those in fields outside but related to human factors/ergonomics – please send their contact information to the Communications Department (lois@hfes.org, 310/394-1811), and we will invite them to submit their work.

ANSI Approves Software Ergonomics Document as an American National Standard

By Paul Reed, Chair, HFES 200 Committee

The HFES *Human Factors Engineering of Software User Interfaces* document (known as "HFES 200"), approved by the American National Standards Institute (ANSI) in August 2008 as an American National Standard, represents the culmination of many years of effort from an extraordinarily talented and tenacious group of leading human factors professionals. The ANSI/HFES 200-2008 standard is a major landmark in the field of human-computer interaction (HCI). It represents the first U.S. national standard for software accessibility and human-computer interaction design, and it will help improve the usability and accessibility of software for millions of users.

The HFES 200 software user interface standard consists of five parts:

- HFES 200.1: Introduction (Paul Reed, editor)
- HFES 200.2: Accessibility (Gregg Vanderheiden, editor)
- HFES 200.3: Interaction Techniques (James R. Williams, editor)
- HFES 200.4: Interactive Voice Response (IVR; Daryle Gardner-Bonneau, editor)
- HFES 200.5: Visual Presentation and Use of Color (Aaron Bangor, editor)

The four technical sections of the standard define design guidelines based on research findings, established best practices, and the consensus of international experts. This standard is a remarkable achievement particularly because of its meticulous harmonization with international efforts in the International Organization for Standardization (ISO) and the accompanying wide-ranging issues that had to be addressed and resolved. Thanks to the leadership of HFES 200 editors in ISO activities, the HFES 200 section on software accessibility was a major, formative contribution and became the principal source of content for the corresponding ISO-171 standard on software accessibility.

HFES undertook the 200 project following extensive participation in the development of international standards through ISO. Key principles driving the HFES 200 Committee's contributions to ISO were the use of design guidance based on robust empirical findings and established industry practices. The objective of the HFES 200 standard is to consolidate available design guidance to provide design requirements and recommendations that will lead to usability benefits, such as increased ease of learning and ease of use of software, and accessibility benefits such as increased compatibility of assistive technology with available operating system software.

The HFES 200 Committee developed the consolidated design guidance as an American National Standard using procedures approved by ANSI. The committee initiated consensus-building processes in July 2006 with the formation of a canvass committee consisting of key stakeholders, including software producers, software users, and those with a general interest in the topic. The process required three public reviews, announced in *ANSI Standards Action*, and two separate ballots. The reviews generated many hundreds of comments from stakeholders. ANSI procedures require that every single comment be addressed, and the comments from all stakeholders, along with the disposition of each comment, must be documented and distributed to all stakeholders for a second ballot.

Recognition is due first and foremost to the editors of the four major technical sections constituting the standard: Greg Vanderheiden, James Williams, Daryle Gardner-Bonneau, and Aaron Bangor.

HFES 200 can be purchased from the HFES Web site at http://www.hfes.org/Publications/ProductDetail.aspx?ProductID=76.

Ergonomics Standards for Guiding Principles and HSI

By James R. Williams, Chair, U.S. TAGs to ISO TC 159/SC1 and ISO TC 159/SC4

In this article, I provide an update on the work of two of the subcommittees of the International Organization for Standardization (ISO) Technical Committee on Ergonomics (TC 159) and the activities of two of its associated U.S. technical advisory groups (TAGs): ISO/TC 159/SC1, Ergonomic guiding principles; and ISO/TC 159/SC4, Ergonomics of human-system interaction.

ISO/TC 159/SC1

SC1 is charged with producing general standards that apply across various subject areas within ergonomics. Its scope is "standardization of general ergonomics principles for the design and evaluation of products, systems, services, and environments." Germany (DIN) holds the secretariat for SC1, and Georg Kramer of Germany is its current chair.

TC 159/SC1 has the following active Working Groups:

- **WG1 –** Principles of ergonomics and ergonomics design
- **WG2 –** Ergonomic principles related to mental work (ISO 10075)

Currently, only WG1 is active; it has been working on a revision to 6385-1 (previously published as "Ergonomics principles in the design of work systems"). The intent of revising 6385 is to produce a general standard covering ergonomics principles and design that apply across the various ergonomics areas covered by TC 159. Although the vote for the Committee Draft of the revised 6385 was for approval, three European countries voted "no," including Germany, which wanted to keep 6385 as a work system standard. The compromise plan is to give the revision a new number and keep the 2004 ISO 6385 standard on work systems, which will be revised later. Because of the large number of comments

on the committee draft, a second draft is planned after the comments are taken into account.

The U.S. TAG to TC 159/SC1 reviewed and commented on the 6385-1 committee draft. However, we have only about a half-dozen active members in the SC1 TAG and need additional members in order to provide a balanced U.S. position on standards being developed by SC1. If you are interested in joining this TAG, please contact me (see page 7).

ISO TC 159/SC4

The subcommittee for standards concerning the ergonomics of human-systems interaction (SC4) was formed in 1984 with the initial charter to develop standards in the area of "Ergonomic requirements for office work with visual display terminals (VDTs)". However, SC4's charter has been expanded to include all of the areas of human-systems interaction. Its current scope covers the following:

> Ergonomic standardization of the interaction between systems (often computer based) and the people who design, manufacture, use, and maintain them. Areas of standardization include hardware ergonomics (including input, display, and interactive devices), software ergonomics (including dialogue and interaction design) and human-centered design processes and methods (including usability engineering and participative design methods).

The United Kingdom (BSI) holds the secretariat of SC4, and Tom Stewart from the UK is its current chair.

The standards being produced by SC4 are particularly important because the European Economic Community's standards organization (CEN) is adopting them as CEN standards. This process (based on the Geneva agreement) requires that CEN members vote concurrently with ISO members on Draft International Standards (DISs) developed by TC 159. Therefore, it is very important that the U.S. TAG carefully review all these ergonomics standards to ensure that they are based on firm technical grounds and will not put U.S. companies at a disadvantage.

The original 17-part ISO 9241 standard (Ergonomic requirements for office work with visual display devices – VDTs) was the primary standards series developed by SC4. These standards included parts covering both hardware and software. In addition, a number of standards were produced by SC4 that were not in the 9241 series. With the decision to change SC4's title to "human-system interaction," SC4 developed a new numbering scheme to cover all of the human-systems interaction standards. Revisions to the original 9241 standards as well as new standards will be numbered according to the new scheme.

In addition, SC4 is responsible for the ISO 11064 series (Ergonomic requirements for control centers) and several standards originally developed by CEN and voted on in ISO (e.g., ISO 1503 and ISO 9355).

TC 159/SC4 has the following Working Groups:

- **WG1 –** Fundamentals of controls and signaling methods, (completed the revision of ISO 1503 – Spatial orientation and direction of movement – Ergonomic requirements). WG1 will work on the ISO version of Part 4 of ISO 9355 (Ergonomic requirements for the design of displays and control actuators) when it is completed in CEN.
- **WG2 –** Visual display requirements (developed ISO 9241, Parts 3, 7, and 8; ISO 13406, Parts 1 and 2; and has completed revisions to most of these standards, now published in the 9241-300 series). Currently, technical reports are in progress with regard to glare/gloss and 3-D displays. There is some ongoing discussion of color rendering.
- **WG3 –** Control, workplace, and environment requirements (developed ISO 9241, Parts 4, 5, 6, and 9 and completed the revision of several input device standards – now published in the 9241-400 series). Next on the agenda for the 9241-4xx series are submissions for approval of New Work Items Proposals for Parts 411 and 420. These two parts deal with laboratory test methods and user selection procedures. Part 420 has been submitted as a DIS, given that it had previously passed its Committee Draft vote. WG3 still needs to revise the workplace and environment standards.
- **WG5 –** Software ergonomics and human-computer dialogues (developed ISO 9241, Parts 10–17 and ISO 14915, Parts 1– 3). WG5 recently completed the revision of dialogue principles (now ISO 9241-110), ISO 9241-151 (WWW user interfaces), and ISO 9241-171 (software accessibility). WG5 is currently working on ISO 9241-100 (Introduction to standards related to software ergonomics), ISO 9241-129 (Guidance on software individualization), and ISO 9241-154 (Design guidance for interactive voice response) and expects to work on the revisions of the form-based dialogue standard (which was ISO 9241-17) and the menu standard (9241-14).
- **WG6 –** Human centered design processes (developed ISO 13407, ISO 9241-20: Accessibility guidelines for communication equipment and services; and a number of technical reports concerning human-centered design development and assessment). WG6 is working on the revision of 13407, which will be published as ISO 9241-210.
- **WG8 –** Ergonomic requirements for control rooms (ISO 11064, Parts 1–7). All standards in ISO 11064 have now been published.
- **WG9 –** Haptic and tactile interaction (ISO 9241-900 series). ISO 9241-920 (Guidance on tactile and haptic interaction) has been approved, and WG9 will be considering the comments on the first Committee Draft of ISO 9241-910 (Framework for tactile and haptic interaction) to improve it for resubmission as a Committee Draft. That group is also developing a first Working Draft of ISO 9241-940 (Evaluation of tactile and haptic interaction).
- **WG10 –** Accessible design for consumer products (ISO 24503 – Ergonomics – Marking tactile dots on consumer products). The Committee Draft for marking tactile dots was recently sent out for a vote.
- **JWG (JTC 1/SC7 & TC 159/SC4) –** Common Industry Format (CIF). This Joint Working Group is responsible for

developing requirements for standards in the "Software Quality Requirements and Evaluation" (SQuaRE) series concerning common industry formats for usability-related information. The JWG recently produced ISO/IEC PDTR 25060, which is "General Framework for Usability-Related Information," and is preparing New Work Item Proposals for a number of documents indicated in the framework (e.g., user requirements, user needs report).

Opportunities for Involvement

The major purpose of the U.S. TAG is to review standards and proposals being produced by the subcommittee and to recommend to the American National Standards Institute (ANSI) the U.S. position on these standards or proposals. It is important that the U.S. position be based on input from both individuals and organizations representing various U.S. interests in the area being standardized. Therefore, we welcome applications for TAG membership by people or organizations not currently represented. TAGs are responsible for recommending U.S. experts (to ANSI) for membership in Working Groups and arranging and coordinating subcommittee and WG meetings that take place in the United States.

The major responsibility of TAG membership is to vote and comment on documents that are distributed by the ISO subcommittee for votes by national bodies. Distribution of all documents, as well as voting and commenting on standards, is done by e-mail. We do require a reasonable level of participation (by voting and commenting) for continued TAG membership.

A more intensive level of involvement in ergonomics standards is service as a U.S. expert in a Working Group. Given that the content of standards being developed is based primarily on expert contributions within the WGs, it is critical for the United States to provide them with as many experts as possible. To be nominated as an expert to a Working Group, a candidate must provide evidence of expertise in the subject area and indicate that funding is available to travel to WG meetings. Expert nominations are voted on by the TAG membership, and the names of those approved are forwarded to ANSI for submittal to ISO.

Please direct any inquiries about the U.S. TAG to ISO/TC 159/SC1 or SC4 to James R. Williams (ergojim@earthlink.net) or Lynn Strother, c/o HFES, U.S. TAG Administrator to ISO/TC 159, P.O. Box 1369, Santa Monica, CA 90406-1369, lynn@hfes.org.

MEMBERSHIP

Time to Renew!

HFES is grateful for your membership! Dues renewal statements have been mailed, and we look forward to continuing to serve you in 2009. Don't forget we've recently added a new benefit to make your membership even more valuable: The HFES Digital Library archive will put at your fingertips back volumes of *Human Factors*, *Ergonomics in Design*, and *Annual Meeting Proceedings*.

Membership renewal is easy. Either fill out and return the renewal form, or take advantage of the convenience of renewing online at http://hfes.org. All transactions are secure. To renew online, log in with your username and password (if you've misplaced this information, just e-mail the Member Services Department at membership@hfes.org). In addition to renewing your membership, you can update the information in your member record, join or renew your technical group memberships, change your delivery preference for *Human Factors* or *Ergonomics in Design*, and order publications at special member prices.

IMPORTANT: To ensure that your correct contact information appears in the *2009–2010 Directory and Yearbook*, you must renew by January 31, 2009. You will also avoid the postage surcharge when you renew by January 31.

We hope you'll continue your participation in HFES and also encourage your colleagues to join.

NATIONAL ERGONOMICS MONTH

NEM at EYH Career Day

By Ruth Loewenhardt

In celebration of National Ergonomics Month (NEM) in October, 30 middle school and high school girls attending the Expanding Your Horizons in Science and Mathematics (EYH) career day learned about ergonomics as a career and received NEM wristbands and stickers from HFES as reminders of the lessons they learned during the event's three sessions.

EYH conferences nurture girls' interest in science and math courses and encourage them to consider careers in science, technology, engineering, and math. EYH was started in 1974 as an informal group of women scientists and educators in the San Francisco Bay Area who were concerned about girls' low participation in math courses.

Two years ago, Cheryl Bennett (1951–2007) of Lawrence Livermore National Labs (LLNL) invited me to speak with her at EYH to promote the field of ergonomics to students from Stockton, California. The event was sponsored by the University of the Pacific School of Engineering, LLNL, and Sandia National Laboratories. On October 4, 2008, I returned to EYH in Stockton and presented 3 one-hour, hands-on workshops.

The sessions consisted of solving a backpack mystery and learning how to discover what actions cause aches and pains. Girls learned how to calculate backpack percentage weights and discovered what weight they should be carrying on their backs. They then designed their own backpacks using their personal back measurements as a guide. Each of the students was given an NEM wristband to wear as a reminder that she should think about the ergonomics of her work environment in whatever profession she decides to pursue.

Ruth Loewenhardt is a consultant who works with telecommuters, small business owners, and clients in the home office environment and provides ergonomics instruction to students in local schools. She received an M.S. in human factors and ergonomics from San Jose State University and started her own company, Elegant Ergo, based in Pleasanton, California.

THE DEPARTMENT OF MECHANICAL AND INDUSTRIAL ENGINEERING AT THE UNIVERSITY OF TORONTO
invites applications for a tenure-stream appointment in the field of **Human Factors Engineering**.

The appointment will be at the rank of Assistant or Associate Professor, and will begin on July 1, 2009.

Candidates whose research interests lie in the area of *cognitive human factors* are especially encouraged to apply. Preferred applicants will be expected to develop a strong and independent research program in one of the focal points of our Strategic Plan: Healthcare systems, Biomedical engineering, Alternative energy systems, and Manufacturing.

Candidates must have effective teaching ability and will be expected to make a major contribution to the Undergraduate and Graduate Programs. Applicants must have a doctoral degree, an outstanding academic record, and be prepared to obtain registration as a professional engineer. A minimum of 1–2 years of postdoctoral experience in a research setting would be a strong asset.

Salary is commensurate with qualifications. Additional information on the Department can be obtained at http://www.mie.utoronto.ca.

Please send applications to:

Professor A.N. Sinclair, Chair
Department of Mechanical and Industrial Engineering
University of Toronto
5 King's College Road, Toronto, Ontario, M5S 3G8

or by e-mail to chair@mie.utoronto.ca

Applicants should include a detailed curriculum vitae, a clear statement of their specific teaching and research interests, and the names of three persons able to provide references in support of their application. The closing date for all applications is **December 10, 2008.**

The University of Toronto is strongly committed to diversity within its community and especially welcomes applications from visible minority group members, women, Aboriginal persons, persons with disabilities, members of sexual minority groups, and others who may contribute to further diversification of ideas. All qualified candidates are encouraged to apply; however, Canadians and permanent residents will be given priority.

Bulletin

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FLASH!

2009 Applications for Fellows

The due date for nominations for Fellows is February 2, 2009. The Honorary Fellow designation has been discontinued. Please see page 3.

Annual Meeting Survey

If you attended the 52nd Annual Meeting, you should have received an e-mail with a link to an online survey. If you did not receive the e-mail, please contact Lois Smith at the central office, lois@hfes.org.

World Usability Day: November 13, 2008

The theme for 2008 World Usability Day is Transportation. Visit the WUD Web site at http://worldusabilityday.org/.

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