Augmentative Communication News

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UPFRONT

This issue focuses on seeing. People who have severe speech/language problems, developmental disabilities and neurologic problems often have visual impairments (VI). Vision has a profound impact on the selection and use of augmentative and alternative communication (AAC) symbols, devices, techniques and strategies. Unfortunately, a cursory review of the literature reveals little information about VI and AAC.

My goals are to raise awareness about VI and AAC practices pertinent to persons with low vision or blindness. Practitioners and consumers are encouraged to seek professionals who understand VI and can help AAC teams make accommodations for visual problems. This issue does not specifically address individuals with both hearing and vision problems. Dual sensory impairments were highlighted in a previous issue of ACN.[1]

What's to be done? Try to imagine what it might be like to see differently. Sighted people truly can never know what it is like to be blind, have a visual field deficit or cataracts. However, those who are developing communication solutions for individuals with VI must be sensitive to the impact vision has on *(cont. on page 2)*

For Consumers

The ABC's of vision in AAC

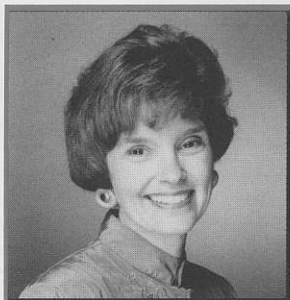
More people experience visual impairment (VI) than any other type of functional loss. If you haven't yet, just wait! Presbyopia lurks around that 40th corner!

VI is a term used to describe visual acuity between 20/70 and 20/200. Legally blind means visual acuity of 20/200 or less in the better eye with corrective lenses, or a visual field loss of 20 degrees or more.[2]

Legal blindness is an old-fashioned concept, rooted in the premise that vision much below normal is useless.[3]

Nearly 40 million people world-wide are classified as legally blind although most (80%) have some residual vision that may be useful.[4] Approximately two-thirds of all people with VI are over 65 years of age. The prevalence of VI and blindness among minorities is high—the rate for African-Americans is double that of whites of comparable socio-economic status.[5] Many individuals with multiple impairments have VI. Between 75 and 90% of school-aged children with severe/profound cognitive disabilities and approximately 40% of those with cerebral palsy (CP) have visual problems.[6] Functional vision—vision that is reasonably useful—requires a fairly intact visual system and the motivation, experience, and understanding a person brings to the "seeing" task.[7]

(cont. on page 2)



(UPFRONT cont. from page 1)
communication. **For Consumers** gives basic information about the visual system, visual impairments and possible AAC accommodations. **Clinical News** introduces assessment ideas and practices. **Equipment** discusses symbols, materials and technologies that can enhance communication and allow people who are blind or visually impaired to access language. **Governmental** highlights three examples of people working together to define and solve problems. Finally, **University & Research** describes some projects at the Smith Kettlewell Eye Institute. Thanks to those listed in **Resources** for sharing information and time.

Audiotapes anyone? We've been asked to provide audiotape recordings (together with additional commentary) as an alternative format for each issue of ACN. I'd appreciate your ideas and comments: Would you order tapes? Would you want the printed newsletter also? How much should tapes cost? Please call the Hotline (408) 649-3050; FAX (408) 646-5428; E-mail sarahblack@aol.com. If there is sufficient interest, we'll begin with the January, 1995 issue. THANKS!

I'm off to Maestricht and the 1994 Biennial ISAAC Conference. Claudia, my assistant, will be holding down the "fort." We've just moved—but only next door! The new address is 1 Surf Way, **#237**, Monterey, CA 93940.

Sarah W. Blackstone, Ph.D.

For Consumers *(cont. from page 1)*

The visual system

The visual system is complex. The process of seeing involves a sequence of events—the reception of light and sensory stimuli through the eye, the transmission of electrical impulses along the optic nerve and the interpretation of these impulses as an image in the visual cortex of the brain. The anatomic structures involved are interrelated and very complex.[2] Optometrists, ophthalmologists, VI specialists and manufacturers as well as some psychologists, educators, administrators and families, focus on solving the complex problems of individuals who are blind or visually impaired.

What can go wrong?

Low vision and blindness limit the quality and quantity of a person's experiences. Difficulties may originate in the cornea, lens, retina, optic nerve, brain stem and/or other parts of the visual pathway up to and including the visual cortex. Common visual impairments include:[2]

- Nearsightedness. Can focus up close, but vision is blurred at a distance.
- Farsightedness. Can focus at a distance, but vision is blurred up close.
- Astigmatism. Visual image is distorted. Usually accompanied by nearsightedness or farsightedness.
- Cataracts. Lens becomes opaque, obstructing part or all of view.
- Glaucoma. Peripheral vision diminishes. Can cause total loss of vision.
- Detached retina. Retina comes loose causing blindness or blind spots.
- Macular degeneration. Failure of the small region in center of retina causing blind spots. Can interfere with fine discrimination needed for reading and using graphic symbols.
- Strabismus. Convergence and muscle imbalance resulting in poor focus or double vision makes focusing, fixing and tracking more difficult. Binocularity occurs in many children with CP.
- Amblyopia. Reduced vision from lack of use or lack of clarity of vision during early childhood. A consequence of strabismus.
- Hemianopia. Lack of peripheral vision on one side of the visual field of both eyes. Requires active scanning of visual information.
- Visual field defects. Blind spots which result in a lack of awareness (neglect) of objects. Requires active scanning of visual information.
- Nystagmus. Oscillations or tremors of the eyes occurring independently of normal eye movements.

Finding solutions

More than one type of visual problem can occur so it can take years to figure out the functional vision of multi-handicapped individuals who are unable to speak.[8] In addition, a range of accommodations can be made; and more and more visual problems are now "fixable" using less invasive techniques. Be sure to check with a knowledgeable developmental or behavioral optometrist. Table I depicts components of vision that have an impact on the selection and use of AAC techniques.

Visual acuity. Impaired acuity, with a variety of etiologies, is the most common visual problem. Visual acuity allows us to discriminate details close up and far away. Acuity impairment classifications vary from partially sighted to totally blind and include visual field defects.

AAC system accommodations. Consider the size, position and type of symbols being used, how they are presented and how the individual will select them. Color and contrast (i.e., figure/ground) can greatly enhance acuity. Lighting also is important.

Visual fields. Mapping visual fields to determine the location of blind spots is helpful. Central fields discriminate color and shape in daylight conditions. Peripheral fields are sensitive to

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Table I. Components of functional vision: Effects on AAC design				
Component	**Definition**	**Normal**	**Impairment**	**Effect on AAC design**
Visual acuity	Clarity of vision up close and from a distance.	20/20 (distance from stimulus required to see compared to person with normal vision). Normal fields.	May be caused by an unclear lens system, refractive errors, ocular-motor problems, damage to the retina or optic nerves or impaired ability to interpret visual information in the brain.	Affects type and size of symbols as well as color and contrast between symbols and background in a display. Need to consider optimal distance of the display from AAC user and user's illumination requirements.
Visual fields	Areas in which objects are visible without a shift in gaze.	150 degree arcs from right to left. 120 degrees up and down. High acuity in central field. Peripheral field detects movement.	Blind spots vary in shape and size. *Central* - difficulty seeing at midline. *Peripheral field* - difficulty moving because can't detect movement or locate objects on the side or below. Person may be constantly shifting positions to accomodate.	Need to know the location of affected areas, their size and shape and how defects affect functional vision. May require adjustment of point of fixation and head position. Often affects proper placement and arrangement of symbols, devices and materials.
Oculomotor functioning	Movement of eyes. Muscles control unified focus.	Eye muscles establish and maintain visual focus. Scan, fixate, locate and track objects.	*Strabismus* - focus is compromised because direction of eyes is not coordinated. *Nystagmus* - involuntary movments of eye resulting in reduced visual acuity. Probably not a muscle problem.	May need to adjust head and body positions to compensate. Affects location and orientation of device/display, configuration of symbol array and spacing of items on the display.
Light sensitivity	Amount of ambient light required to see.	Daylight or medium artifical illumination is adequate.	Varies according to the etiology of the visual problem. Those with retinal problems may require low light conditions; those with nearsightedness or presbyopia may require increased illumination.	Need adequate lighting for displays. Will vary with type of disorder. Positioning of materials and use of non-reflective surfaces can decrease glare. Sunshine is a problem with computer displays and AAC devices.
Color sensitivity	Perception of color.	A full spectrum of color based on structures within the eye being stimulated at specific wave lengths.	Some disorders depress the reception of certain colors (e.g., cataracts). Total color blindness is rare (8% males and .4% females). Red and green are most often confused.	Use colors on displays that are helpful to user. Color vision will vary with type of impairment so be careful when using color codes. Colors can help provide good contrasts.
Cortical vision	Ability to interpret visual information	Intact visual pathways up to and including cortex.. Able to perceive, interpret and create inner maps/images.	Visual inattentiveness. Lack of visual acuity caused by central nervous system damage. Inconsistency, fluctuations in functional vision and perception. Associated with severe cognitive/motor problems.	Attaching meaning to visual images, including symbols is problematic. Learning is compromised. Tactile and auditory input is critical. Requires manipulation and experiential-based instruction.

motion, contrasts and low light conditions. People who lack central vision depend on peripheral vision and may turn away from an object/person in order to see it with peripheral vision (i.e., eccentric viewing). Be careful. This may be confused as a positioning rather than a visual problem.

AAC accommodations. Just because you have a good map of a person's visual fields doesn't mean you know about functional vision. Check to see how "blind spots" affect function. Adjustments in positioning of symbols and displays and in mounting devices may be necessary.

Oculomotor functioning. Eye muscles allow people to scan, locate, fixate and track moving objects. People may need to shift their bodies to make accommodations. If motor problems or positioning constraints interfere, seeing can be difficult.

AAC accommodations. Pay attention to the design of displays. Adjust the positioning of a person and/or equipment. Sometimes the angle of a display is critical. How the person tilts his/her head also can make a difference.

Light and color sensitivity. Color and illumination factors can vary with the type of VI. For example, as we age and presbyopia occurs, more light is required to see. Sensitivity to certain colors may be depressed depending on the visual impairment, but color blindness is rare.

AAC accommodations. Appropriate use of color and lighting enhances acuity and makes perception easier. Illumination on a display or device screen must be adequate and without glare. Sunny days can be a problem. Back lighting is important. Color provides contrast. Yellow backgrounds are often better than white.

Cortical vision. Cortical visual impairment (CVI) occurs with damage to visual pathways leading to and including the visual cortex. It is generally caused by a lack of oxygen to the brain (anoxia).[9] Prematurity is a major etiology of CVI as more fragile babies are surviving. CVI also occurs following anoxic events associated with head trauma, hydrocephalus, meningitis and encephalitis. Studies suggest a gradual visual recovery extended over several months to years in people who acquire CVI. Those who have congenital CVI have more difficulty because learning is so dependent on vision and other problems associated with brain damage are often present. Clinical symptoms of CVI include visual inattentiveness and a lack of visual acuity. Because eye movements are not affected, individuals may not appear to have impaired vision.[10]

AAC accommodations. Individuals who are unable to attach meaning to visual information remain severely compromised in learning, language development and communication. CVI will interfere with the use of AAC system components.[10] Children with CVI often benefit from auditory scanning and motor experiences that allow them to interact with and learn the meaning of objects, events and people. Motor memory (i.e., the mental map we use to carry out our rote movements) may be critical to an individual with cortical blindness to establish meaning.[11] A good source of information is the deaf-blind literature.[12,13,14]

Clinical News

Seeing is what seeing does

From birth, eye contact binds mother to child. Paralinguistic features (i.e., gesture, facial expressions, proxemics and eye contact) underlie the effectiveness of human interaction. According to Lea Hyvarubeb, M.D., "severely visually impaired children lose thousands of hours of incidental learning and visual communication and have to build numerous concepts on patched information with obvious holes in their knowledge."[15] Individuals who also are unable to speak, particularly those who have motor impairments, lose many thousands more. Most people with VI need a sighted interpreter who can share the world and help them manage and learn. The fact is much incidental learning is precluded when you don't see well. It is essential that individuals with VI be able to ask questions and communicate feelings and thoughts.

Severely visually impaired children lose thousands of hours of incidental learning and visual communication.[15]

Functional vision assessments and compensatory techniques and strategies for visual impairments are critical to AAC practice. An individual's body, eyes and mind affect what is seen. So does the position of the individual in the environment. Mobility factors, lighting level and the skills of communication partners also affect communication. Assessment of the visual system in persons with multiple handicaps, especially children, may include:[16]

- eye examination by a developmental/behavioral optometrist.
- interviews with caregivers.
- observations of daily activities (e.g., watch for decreased body alignment, fatigue after working on visual tasks, and so on.)
- consultation with other members of AAC team.
- use of a assessment tools developed for persons with multiple handicaps or young children.

Dr. Hyvarinen, an ophthalmologist from Finland has developed materials to assist in the assessment of vision. Among the kits that are available are:[15]

- a discrete symbol set (apple, circle, square, house—2 and 3 dimentional options) and protocols to train. Note: a variety of response modes are available.
- Functional acuity test.
- Binocular test.
- Color test.
- Preferred looking protocol.

Batstone and Harris[17] presented assessment suggestions for use with children with severe communication and visual impairments. A protocol called "Assessing the functional vision of people with severe and multiple disabilities" considers the following areas:[18]

- **Body**. Gross motor, independent mobility, arm/hand function and eyes (reflexes, refraction, acuity, symmetry, visual perception, visual noise tolerance, visual abstraction and use of vision.)
- **Illumination.** Position and type of light source in the environment, on materials and on a communication display.
- **Contrast**. Figure/ground characteristics are very important to functional vision. The size, color and complexity of information in the "figure" and in the background determine the degree of contrast.
- **Size**. Just making something larger does not necessarily make it easier to see. Size characteristics should depend upon the characteristics of the stimuli as well as the nature of a person's VI.
- **Distance**. The distance of a person from the visual target will affect acuity. Please note: Harris uses a simulator that allows him to get an idea about how a person sees things.[21]
- **Verbal formulas**. The way you talk to a person is important. When providing choices, present the task in the same format, give the person time and be predictable. For example: *It's time for a break.. Here is your cup.* [Move it slowly across the person's visual field.] *Here is your sweater*. [Move it slowly across the visual field.] *Now, I'm going to show them both to you. Look at/touch the one you want.*

Another valuable assessment tool with an AAC perspective is the "SAAT—Systematic Assessment of Assistive Technology," which is available from Bristow & Pickering. See **Resources.**

Teaching individuals with VI will be more effective if you:

- involve their hands with communication media.
- pair symbols with sound.
- use familiar media in familiar activities so context cues may be used.
- base communication training within an individuals most familiar activities.

RESOURCE CENTERS

The best are in your city, town or region. Below are some examples of national resources in the U.S. Many have links with other centers within and outside the U.S.

American Foundation for the Blind, National Technology Center, 15 W. 16th St., New York, NY 10011. (202) 620-2080.

Carroll Center for the Blind, 770 Centre St., Newton, MA 02158. (617) 969-6200.

Foundation for Technology Access. 2173 E. Francisco Blvd., Ste. L, San Rafael, CA 94901. (415) 455-4575.

Nationally Association for Visually Handicapped, 22 W. 21st St., New York, NY 10010. (212) 889-3141.

National Federation of the Blind (NFB), 1800 Johnson St., Baltimore, MD 21230. (410) 659-9314.

Sensory Access Foundation, 399 Sherman Ave, Ste 12, Palo Alto, CA 94306. (415) 329-0430.

Equipment

Low & high tech options

In developing an AAC system for someone who has VI, it is crucial to find ways to help the person receive information and learn, as well as communicate with others. This section focuses on tactile, auditory and visual symbols and devices specifically designed to assist people with low vision and blindness.

Table II. Symbol options for AAC users with visual impairments (with input from Bristow, Gilden and Pickering)

	To receive language		To express language	
	Low Tech	**High Tech**	**Low Tech**	**High Tech**
Blind AAC users	Speech; Tangible symbols; Braille; Raised symbols/ letters.	Speech (screen reader, AAC device); Morse code; Tactile symbols/braille; Aud. signal-key echo	Speech (e.g., listener assisted auditory scanning); Writing; Sign; Tactile symbols on device	Speech (screen readers; AAC devices); Refreshable braille display; Optical character readers;
Blind AAC users with severe motor impairments	Speech.	Synthesized, digitized/recorded speech (e.g., computers, Talking books); Morse code	Speech (e.g., listener assisted auditory scanning); Morse code.	Speech (AAC device with auditory scanning, Morse code, Screen readers); Auditory signal-key echo.
Low vision AAC users	Speech; Modified graphic symbols/letters/numbers	Speech (screen readers, AAC device); Enlarged text or graphics; Auditory signal-key echo.	Speech (e.g., listener assisted auditory scanning); Writing; Pointing to symbols/text.	Speech (screen reading programs, AAC device). Enlarged text or graphics; Auditory signal-key echo.
Low vision AAC users with severe motor impairments	Speech; Modified graphic symbols/letters; Low vision devices.	Synthesized, digitized/ recorded speech (e.g., communication devices, talking books, screen readers) Enlarged text or graphics.	Speech (e.g., listener assisted auditory scanning); Morse code.	Speech (Morse code; screen reading programs, AAC device with auditory scanning). Enlarged text or graphics; Auditory signal-key echo.

Symbols

Some people with low vision who don't speak can use print (i.e., text and/or graphic symbols.) Many others, including those who are blind, must depend upon tactile and auditory symbols to develop and use language. Table II summarizes symbol options for AAC users who are blind or visually impaired.

Tactile symbols

- **Tangible.** Textured symbols, real objects or parts of objects can be used with very young children and those who have severe cognitive and language impairments. "Symbols" that become relevant and meaningful provide individuals with access to language. Only then can they be used to make requests, comment and so on. Tactile symbols are most easily used one at a time, but can be placed on low tech displays, switches and AAC devices. Few users with severe motor impairments are be able to communicate independently using tactile symbols (tangible or Braille.)
- **Braille:** A tactile symbol system for reading and writing used by a small percentage of persons who are blind. Many countries have adapted Braille to suit their language and cultural patterns. Braille characters are formed using combinations of six embossed (raised) dots arranged in two vertical columns—three dots in each. Each character may represent a letter, a part or an entire word or concept. Symbols exist for music notations (Music Braille code), arithmetic and mathematical computations (Nemeth code) and scientific notions and computer commands (computer code.) Table III lists products that allow individuals access to Braille materials.

Auditory symbols

- **Morse code**: An international auditory (or tactile) code for reading and writing. It consists of dot and dashes which represent letters, words, phrases, and more. Some AAC devices translate Morse code to text and speech.
- **Speech.** Speech and other auditory stimuli play a very important and powerful role in learning. Speech output is also used to enable people to access written language and graphics. Examples are talking books, reading machines, computerized books and screen reading programs. Talking watches and other consumer technologies are readily available. For some AAC users, listener-assisted and machine generated auditory scanning may be the only means of accessing language.

Speech output as a means of expression is sometimes overlooked for AAC users with VI because AAC devices do not easily accommodate tactile symbols or large graphic symbols. This is truly unfortunate. How are people with low vision or blindness who can not speak supposed to interact with children, get attention and function independently in the community or classroom without speech output? AAC devices are beginning to offer features that will accommodate visual deficits, such as auditory scanning, auditory fishing and color displays with good resolution. In addition, digitized speech devices are low cost. Finally, synthesized speech allows access to computers and may be the best way for many to develop written and "spoken" language skills.

Visual symbols

- **Print:** The size, quality, contrast, line thickness, color, arrangement and position of text and/or symbols can be altered using both low and high tech solutions. Low vision devices provide access to printed materials under specific conditions. Examples are filters, magnifiers, sunglasses, large phone dials, special light pens, telescopes and telemicroscopes. Screen enlargers, closed circuit TVs, and optical character readers enable people with low vision to "see" print.

Table III gives a few examples of currently available devices for persons with VI or blindness, including some *braille products* and low tech visual aids.[20] *Screen readers* translate text and some graphics on computer displays to speech. *Closed circuit TVs* and *screen enlargers* provide magnification to enlarge print/symbols and enhance figure-ground contrasts. *Optical character recognizers* translate printed material into an electronic format that can be stored and accessed via a computer monitor, printer, synthesizer or braille display. In selecting equipment consider accuracy, rate, comprehension, comfort and fatigue. Currently, many AAC devices do not interface easily with devices designed to assist people with VI so check carefully with manufacturers!

Table III. Blind and Visually Impaired Resources (adapted from Bristow and Pickering)

SCREEN READERS (SPEECH SYNTHESIS)	
ScreenPower TeleSensory Corporation	Combination hardware and software enhancement for IBM compatibles in DOS environment. High quality speech. Can work with 40 cell PowerBraille for simultaneous braille and speech output.
Sound-Proof Humanware, Inc	IBM compatibles in MS DOS environment. Highlights each word as spoken with Keynote GOLD speech synthesizer. Works with standard software. Helps individuals with learning disabilities
outSPOKEN (PC and Macintosh) Berkeley Systems, Inc.	Full screen access to most text-based programs. Reads letters, words, lines, menus, icons, windows. Available for Macintosh and PC (windows). Can be combined with inLarge for screen enlargement.
Window Bridge Human ware, Inc	Screen reading program for windows. Reads icons as well as text.
WordScholar Henter-Joyce, Inc.	Developed for persons with learning disabilities. Simultaneous word highlighting as the screen is read.
OPTICAL CHARACTER READERS (MULTIPLE OUTPUTS)	
OsCaR TeleSensory Corporation	Character recognition. Scans and converts print documents on IBM-compatible computers. Reads different fonts. Compatible with various access devices (large print, speech, elctronic/hard-copy braille.)
Reading Edge Xerox Personal Imaging	Scans and convers print documents to speech. Can be saved on audio cassette tape or computer disk. *Kurzwell Personal Reader Family of Products*
Open Book Unbound Arkenstone, Inc.	Scans and converts print documents on IBM compatibles. Once converted and saved, document can be brailled, read with a screen reader or magnified with a text enlargement program.
Optacon II TeleSensory Corporation	Portable device converting visual images on a printed page to tactile configurations via raised vibrating pins. Has magnification lens options and a serial port.
CLOR FILTERS, MAGNIFIERS, STANDS	
NoIR & UVShield Filters Bossert Specialities Inc.	Chemically absorb 100% of ultraviolet infrared and hazardous blue rays. Different colors provide varying degress of light transmission.
Magnifiers Stands Bossert Specialities Inc.	Magnifiers vary in size. Offer different levels of magnification. Stands provide means of altering the height and position of visually presented material.

SCREEN ENLARGEMENT (PRINT AND GRAPHICS) CLOSED CIRCUIT TV	
Close View & EZ Access Apple Computer, Inc.	Magnification software (2x-16x) included in Macintosh systems. Access through control panel. Offers reverse polarity. EZ-Access is for persons with physical disabilities.
inLarge 2.0 Berkeley Systems, Inc	Magnifies everything (2x-16x) on entire screen or a portion. Can select automatic scanning at variable speeds, reverse polarity. Works with outSPOKEN.
MagniCam Innoventions, Inc.	Portable hand-held camera that attaches to a standard television set or small porable TV.
See-PC Vision Seeing Technologies, Inc.	Can connect IBM compatibles and VGA monitor
Vantage Chroma CCD TeleSensory Corporation	Closed circuit TV with a solid-state CCD camera. Magnifies 3x - 45x. Can also be used with VISTA VGA as a split/screen computer magnification system.
VISTA VGA TeleSensory Corporation	IBM-compatible. Magnifies computer screen (3x - 16x). Includes text and graphic magnification. Offers reverse polarity. Has instant locator window.
ZoomText Plus Ai Squared	Software magnification program (1x-8x) for IBM compatibles (DOS and Windows). Works with word processing, spreadsheet, and database programs. Can select color background.
BRAILLE PRODUCTS	
Braille'nSpeak Blazie Engineering	Small portable braille notetaker. Braille to print and speech. Also has note organizer, calculator, clock and calendar. One serial port.
Eureka Robotron Pty. Ltd.	Small portable braille notetaker. Information is entered by 6 keys corresponding to 6 braille dots.
Power Braille TeleSensory Corporation	Refreshable braille display. As information is entered on the computer, the display provides a tactile image of the braille characters.
VersaPoint TeleSensory Corporation	Produces braille documents (Braille embosser). Coverst computer generated text to braille.
TALKING BOOKS	
Books, magazines, newspapers on tape or computer disks	Audiocassettes. Check local resources. In the U.S. the Library of Congress, Braille Institute Library, Recordings for the Blind are good resources.

For addresses, please see list of manufacturers on page 8.

University & Research

RERC on Sensory aids at Smith-Kettlewell

The Smith-Kettlewell Eye Research Institute is located in San Francisco. The Rehabilitation Engineering Research Center (RERC) for Sensory Aids, funded by the National Institute for Disability and Rehabilitation Research (NIDRR), is part of the Eye Research Institute. Among the projects they have worked on are:

- **Research And Development.** A focus is on developing devices for blind and deaf-blind children and adults:
  - Tact Tell learning system. Utilizes interactive modular peripherals which connect to an Apple computer and speech synthesizer.
  - Flexi-Formboard. Improves a child's skill with geometrical shapes through auditory and tactile feedback.
  - Dexter (robotic hand system). Forms manual fingerspelling. Facilitates telephone communication, face-to-face communication and computer access.

Products to assist persons with low vision include new magnifier systems and illumination devices using fiber optics, metal halide and quartz halogen technologies for optimal viewing without unwanted heat and glare.

Products to address employment needs of persons with blindness include:

- Flexi-Meter. A computerized "universal" job instrumentation system and a new speech module for adapting measuring instruments.
- a computer access system using a touchpad to represent the computer screen and a speech synthesizer to speak the contents of the screen at that position.
- a pocket-sized electronic braille notetaker.
- a low-cost refreshable computer braille display.
- auditory instruments to facilitate the interconnection of computers and peripherals by blind operators.

- **Information dissemination.** *The Smith-Kettlewell Technical File* is a technical subscription magazine for the blind and visual impaired.
- **Clinical Services.** A collaborative arrangement with the California Pacific Medical Center's Low Vision Services allows the development of customized aids requested by individuals and/or their rehabilitation counselors, small scale production and sale of limited-market sensory aids, custom software and computer interfacing modifications, expert consultation on job site modifications and operation of an electronics training program for the blind.

Finally, the RERC on sensory aids is developing and testing new assessment techniques, particularly for the early detection of vision disorders.

For additional information contact Smith-Kettlewell Eye Institute, 2232 Webster Street, San Francisco, CA 94115. (415) 561-1620.

Governmental

Groups solving problems

Lea Hyvarinen, an ophthalmologist from Finland whose work is widely known and respected, feels governments are in the best position to support the formation of interdisciplinary groups that enable busy practitioners to brainstorm topics and make headway in a field.[20] A few examples follow:

1. Nordic Countries.[22]

Sweden, Norway, Denmark, Finland and Iceland have a long tradition of working together. This October a small group of ophthalmologists and co-workers are planning a seminar in Oslo, Norway to discuss ways to improve the assessment of children and adults who have visual impairments and problems communicating. Participants at the upcoming meeting will include ophthalmologists, psychologists, neuropsychologists, pediatric neurologists, occupational therapists, physiotherapists and communication specialists. The group will discuss better ways to assess the functional vision available for communication.

Contact Lea Hyvarinen, M.D. for more information. Harmaaparrankuja 3 FIN-02200 ESPOO Finland. FAX 358-0-4208968.

2. Consensus Conference on Protocols for choosing low vision devices.[21]

In 1993 a panel sponsored in the U.S. by the NIDRR developed a consensus statement and a publication in response to the following questions:

- What clinical measurements and functional behaviors define the population of adults who can benefit from low vision devices?
- What are the best standard clinical and functional assessment practices addressing the needs of adults with low vision?
- What are the optical-functional characteristics of available low vision devices that meet the needs of adults with low vision?
- What are the best practices for determining which low vision devices will be most effective in maximizing visual function for adults with low vision?
- What instruction and guided practice currently best insures successful utilization of devices?
- What future research is needed?

3. RERC on Low Vision and Blindness.[22]

Proposed priorities for funding of the next Rehabilitation Engineering Center on Low Vision and Blindness are to:

- develop innovative adaptive devices and engineering solutions to prepare all children with low vision and blindness to enter school (i.e., early identification and monitoring and treatment of visual impairments in neonates and infants.)
- improve visual displays including flat panel displays and liquid crystal displays with low contrast.
- maintain access to new products used in the home, workplace and community such as solid state displays, keypads, and compact disc technology.
- conduct research on the provision of access to public facilities and mass transit.
- develop techniques to increase independent mobility and decrease dependence on others for information and assistance.
- conduct research, develop and evaluate new and adaptive technology for persons with deaf-blindness.

For more information about NIDRR programs and publications, write: NIDRR, Room 3424, Dept. of Educ., 400B Maryland Ave. SW, Washington, DC 20202.

RESOURCES

Kathleen Appley, Vision Associates, 7512 Dr. Phillips Blvd. 50-150, Orlando, FL 32819. (407) 352-1200.

Susan Batstone, Queen Alexander Center for Children's Health, 2400 Arbutus Road, Victoria, B.C. V8N 1V7 Canada. (604) 595-3741

Diane Bristow and Gail Pickering, Bristow & Pickering, 3336 Wrightwood Dr., Studio City, CA 91604. (213) 848-8297.

August Collenbrander, California Pacific Medical Center, 2232 Webster St., San Francisco, CA 94115.

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List of Manufacturers

AiSquared	P.O.Box 669, Manchester Center, VT 05255.
Arkenstone, Inc.	11390 Borregas Ave., Sunnyvale, CA 94089.
Berkeley Systems, Inc.	2095 Rose St., Berkeley, CA 94709.
Blazie Engineering	105 E. Jarrettsville Rd., Forest Hill, MD 21050.
Bossert Specialities Inc.	P.O. Box 15441, Phoenix, AZ 85060.
Henter-Joyce, Inc.	10901-C Roosevelt Blvd., #200, St. Petersburg, FL 33716.
Innovations, Inc.	5921 South Middlefield Rd. #102, Littleton, CO 80123.
Humanware, Inc.	6245 King Rd, Loomis, CA 95650.
Robotron	15428 St. Kilda Rd., Melbourne, 3004 Australia.
Seeing Technologies	7074 Brooklyn Blvd., Minneapolis, MN 55429.
TeleSensory Corp.	455 N. Bernardo Ave., Mountain View, CA 94043.
Xerox Imaging Systems	Kurzweil Personal Reader Products, Centennial Dr. Peabody, MA 01960.

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