

Working toward universal access through research, design & education

December 2017

Dear Friends & Supporters,

Thank you for reading our annual newsletter. In addition to our various projects that are described below, the Beneficial Designs (BD) team moved into a new office location in June of 2017. Please see the footer on this page for updated contact information.

News about our work and history was highlighted in several places this year. In January, Peter gave his annual lecture to the Perspectives in Assistive Technology class at Stanford. The 2015 60-minute presentation on Universal Design philosophies, what BD has accomplished over the decades, and what BD is doing now can be watched at:

http://youtu.be/eJh5fBcuThA

Lakeshore provides BD's High-Efficiency Trail Assessment Process (HETAP) equipment for rent in Alabama and helped host a training for several dozen people in September 2016. A short 6-minute web video explaining the training process including Trail Assessment Information (TAI) is available at:

http://beneficialdesigns.com/images/BDphotos/Oak%20Mountain%20Workshop%20Final%20Cut.mp4

HETAP, TAI, and the Oak Mountain pilot project were also mentioned in the health.gov news blog in July: https://health.gov/news/blog-bayw/2017/07/creating-active-outdoor-opportunities-for-all/

It was also mentioned on the NCHPAD Initiatives/Events page:

https://www.nchpad.org/1544/6527/Universal~Trail~Access~Information~Project

Peter and Seanna published a peer-reviewed paper in the journal: <u>Disability and Rehabilitation: Assistive Technology</u>, "Use of Two Test Methods to Ensure Accurate Surface Firmness and Stability Measurements for Accessibility" on the correlation between instrumented surface indenter and the wheelchair work method data: http://dx.doi.org/10.1080/17483107.2017.1328618

We have a limited number of free copies we can distribute; if you would like a copy please contact us at surfaces@beneficialdesigns.com.

Standards, testing, and projects continue to keep the BD staff and consultants working hard. A new standards committee on Assistive Technology for Air Travel had its first meeting in Washington D.C., with representatives from the airlines, DOT, FDA, disability groups, and wheelchair manufacturers. We have also continued work on standards for the universal design of fitness equipment, the cognitive accessibility of everyday technologies, and adaptive ski equipment. Our wheelchair test lab was quite busy this year and we continue to devote time and resources to wheelchair standards development. The trails and pedestrian access components of Beneficial Designs continue to grow. We are developing new technologies with USDA government-funded research and development that improve the efficiency of conducting assessments of outdoor recreation environments. We are also analyzing data gathered in our PVA-funded research on assistive technologies to improve air travel comfort and safety for wheelchair users.

We would like to share with you the status of our current projects and our successes over the last year. Thank you for your continued interest in our work. We wish you the very best for the New Year!

STAFF

- Peter Axelson, Founder and Director of R&D, presents our work worldwide. He loves spending time with his daughter, Ria, and is an avid mono-skier and pilot.
- Allison Ansel, Office Assistant, attends UNR, enjoys a good book, listening to music, and playing her trombone.
- Ria Axelson, Office Assistant, enjoys reading, playing volleyball for her school, and skiing and traveling with her father in their light aircraft.
- **Bill Blythe**, Facility Manager, enjoys spending time with his wife; likes to cook, play guitar, and work with computers; and leads music at his church.
- Rodrigo Cruz Vera, Wheelchair Testing Technician, is a former Marine who assists us during the busier times.
- Maegan Elkaraki, Office Assistant, loves a good book, playing piano, but mostly spending time with her husband.
- Heather Gertsch, Office Assistant, loves gardening, crafting, Disneyland, and a good cup of coffee.
- Debbie Hester, ArcGIS Expert, provides GIS expertise to our sidewalk assessment projects.
- Kyle Hollingshead, Intern, writes code to assist with data conversion in our sidewalk and trail assessment projects, and enjoys off-roading, swimming, dabbling with computers and electronics, playing piano, photography, and video games.
- Ben Hubbard, Graphic Artist, living in UAE with his wife and new daughter, likes to paint, study, and hike.
- Stephen Pieters, Wheelchair Technician, enjoys riding motorcycles, fishing, and spending time outdoors.
- Paul Schnorbus, Machinist, likes Legos, machining, target shooting, camping, and a well-told story.
- Samuel Schnorbus, Shop Assistant, attends UNR and enjoys snowboarding, paintballing, and shooting.
- Stephanie Schnorbus, Office Manager and Research Assistant, enjoys making music, laughing with family and friends, and lifting heavy things at the local CrossFit box.
- * Emery Schreckengost, Shop Technical Assistant, attends WNC and enjoys music, hiking, reading, and traveling.
- Paola Vazquez, Office Assistant, attends WNC and enjoys being with family, jogging, and working with children.
- Hannah Wetmore, Office Assistant, loves reading, Grace Community Church, and Disneyland.

CONSULTANTS

- Todd Ackerman, Trail and Sidewalk Assessment Coordinator, leads trail and sidewalk assessments and enjoys outdoor activities, traveling with his wife, and teaching the trail assessment process.
- George Clary, Technical Consultant, assists with amusement park ride recommendations and provides input on electromechanical system design and assessment technologies.
- Martin Clemons, Electrical Engineer, designed the HETAP 3 electronics and firmware and is the lead engineer for the new DORAP assessment process that will use mobile devices to assess outdoor recreation environments
- **Barton Cline,** Software Developer and Electronics Technician, assists with maintaining and improving HETAP and PROWAP software and equipment.
- Seanna Kringen, Research Associate, focuses on universal design projects and enjoys traveling with her husband.
- Tip Ray, Trail Assessment Coordinator, helps with trail trainings and assessments.
- Jonathan Skelton, Trail Assessment Coordinator, helps with trail and sidewalk assessments, especially on the East Coast, where he is also a substitute teacher.
- **Jo Anne Snarr**, Accountant, owner of The Balance Sheet, is our bookkeeper working here in the Carson Valley. Jo Anne loves to ride her bike, ride horses, and play golf when she is not crunching numbers.
- Nathan Tolbert, Sidewalk Assessment Coordinator, loves hiking, fishing, and camping with his wife and sons, and enjoys coaching a variety of sports.
- Sharon Vazquez, Consulting Administrative Assistant, enjoys spending time with her family and friends, as well as reading and living life.

BOARD MEMBERS

- Chris Lynskey is intimately familiar with the sidewalk assessment process. With his vast range of financial and management experiences, he is able to guide and advise BD when needed. He loves golf, skiing, and gets regular exercise when he and his wife are walked by Micah their golden retriever.
- Kent Nelson is a UTAP trainer who also assists with designing amusement park ride recommendations. For BD as a whole, he offers valuable advice based on common sense and an ability to see to the heart of issues.

Universal Trail Assessment Process & High Efficiency Trail Assessment Process (UTAP & HETAP) Workshops

NIH/NICHD SBIR Phase II Grant #2 R44 HD29992-02 NIH/NICHD SBIR Phase II Grant #2 R44 HD36538-02



There are currently over 1300 trail enthusiasts who have been trained to lead assessments using the Universal Trail Assessment Process (UTAP). UTAP/HETAP workshops were held throughout North America

this past year. Training started in March at the

Sustainable Trails Conference (in partnership with PTBA) in Bend, OR. Trainings were also held in April at the California Trails & Greenways Conference in Monterey, CA and May at the International Trails Symposium (hosted by American Trails) in Dayton, OH. Volunteers at The Last Green Valley Connecticut received training in September and North Carolina State Park staff were trained by Tip Ray in October. Workshops planned for 2018 include a training at the California Trails and Greenways Conference in Rohnert, CA (March).

Beneficial Designs provides the UTAP training materials and tools through PaxPress while



Trail Access Information Signage Sample

American Trails coordinates the training courses. HETAP 2.5 or 3 software and TrailWare 2.0 can be used to generate Trail Access Information, signage, and trail management reports. Data is uploaded to the TrailExplorer Website at: www.trailexplorer.org. The Lakeshore Foundation put together a short video explaining the benefits of providing TAI: http://beneficialdesigns.com/images/BDphotos/UTAP-HETAP Lakeshore Video 2017-01-26.mp4

For more trails related information contact us at: trails@beneficialdesigns.com

or visit: www.americantrails.org

High Efficiency Trail Assessment Process (HETAP)

USDA SBIR Phase II Grant #2005-03226



This project created the Wheeled Instrumentation Sensor Package (WISP) to collect more accurate, objective information about trails, including shared-use paths, backcountry singletrack trails, OHV, and cross-country ski trails. HETAP systems are being purchased bγ private entities, state and city land managers, and the National Park Service

throughout the U.S. and Canada. This system has been commercially available through Beneficial Designs since 2009. HETAP workshops are available to help train personnel on using the HETAP software and hardware (see UTAP &

HETAP Workshops). A new fully digital HETAP 3 tilt sensor box with improved accuracy and settling time is now available on HETAP 3 carts & rolla-wheels. The new cart design boasts a stronger 1.0-inch frame, with solid "no-flat" tires and upholstery that provides storage improved functionality. Contact us for



more information at: trails@beneficialdesigns.com.

Surface Accessibility

NIH/NICHD SBIR Phase II Grant #2 R44 HD30979-02

Beneficial Designs is now shipping the new Series 100 Rotational Penetrometers (RP). RPs are precision measurement devices that have calibrated, spring-loaded surface indenters to measure



firmness and stability. BD has re-engineered the heart of the system to provide an increase in and accuracy of readings resolution measurement of all surfacing. The new Series 100 RP model has increased accuracy and measures with a resolution of 0.0005 inches. Parks, recreation programs, and school systems should use an RP to ensure that the surfaces of their playgrounds are kept in firm and stable condition. When the DOJ published the 2010 ADA Standards for Accessible Design (15 Sept. 2010), the standards expanded to include requirements for playgrounds. The requirements state that ground surfaces shall comply with ASTM F1951 and shall be inspected and maintained regularly and frequently to ensure continued compliance with ASTM F1951. With the new RP, the results received when testing playground surfaces correlate with the ASTM F1951 standard, as shown in the peer-reviewed article "Use of Two Test Methods to Ensure Accurate Surface Firmness and Stability Measurements Accessibility:" for http://dx.doi.org/10.1080/17483107.2017.1328618

The Canadian Standards Association is currently revising "Annex Η (informative) Children's Playspaces and Equipment That Are Accessible to Persons with Disabilities" in "CAN/CSA-Z614— Children's Playspaces and Equipment" and it has been proposed to add the portable instrumented surface indenter test method for measurement of firmness and stability as an annex to Annex H. The National Center on Accessibility has used the RP to conduct longitudinal studies of various trail and playground surfacing materials to determine how well those surfaces maintain firmness and stability that meets federal requirements. Therefore, an agency can now implement a maintenance schedule using the BD Series 100 RP to verify that required firmness and stability is maintained. For more information about the RP and outdoor surfaces, please visit the US Access Board Website and review the published research under 1) "Exterior Surfaces":

www.access-board.gov/research/completed-research

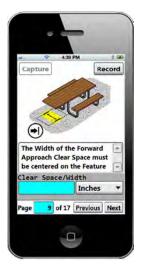
2) "Accessible Exterior Surfaces Technical Report" dated 24 April 1999:

www.access-board.gov/research/completedresearch/accessible-exterior-surfaces
For ordering information, please visit: http://beneficialdesigns.com/products/surfacemeasurement-accessibility

A Standardized Assessment Process of Outdoor Recreation Facilities (DORAP)

USDA SBIR Phase I & II Grant #2008-33610-18906

Since the Accessibility Guidelines for Outdoor Developed Areas (AGODA) became law for Title I entities in September 2014; it is only a matter of time before a similar version is adopted for Title II entities. BD was



awarded a Phase II grant in 2013 to complete the development of the Developed Outdoor Recreation Assessment Process (DORAP). This project has created repeatable measurement methods for assessing the accessibility of outdoor constructed features found in outdoor recreation areas such as parks and campgrounds. A precision study of the process was presented at the 2015 RESNA conference and is available at:

www.resna.org/sites/default/files/conference/2015/jea/hsu.html Mobile devices will be able to access wireless technology that will assist with the assessment of outdoor recreation facilities. These features include picnic tables, tent pads, outdoor rinsing showers, grills, and fire rings, among others. This project will include the testing of a prototype mobile app.

Nevada Recreation Trails Program & NV State Parks

NVRTP Grant #FY 2008-22 & FY 2010-11

We are working with the Nevada Division of State Parks to assess approximately 86 miles of trail and associated trailhead amenities in 5 Nevada State Parks. After assessment is completed, we will

design a panel map for each park, a web/printable map for each park, and approximately 110 Trail Access Information (TAI) Strips. Our goal is to continue making TAI widely available in Nevada for a variety of trails and trail users. In previous projects, we have assessed over 200 miles of trail in 26 different park areas. We have installed 73 different panel maps and over 200 TAI signs.

Public Right-of-Way Assessment Process to Determine Accessibility

US DOT #DTRT57-08-C-10058 & DTRT57-10-C-10081

Beneficial Designs has developed automated Public Right-of-Way Assessment (PROWAP) that systematically Process measures elements within the pedestrian environment, such as curb ramps, severe cross slopes, trip hazards, and pathway obstructions. We are able to reduce the time to perform assessments by up to 80% of the time generally required to perform assessments manually. In addition to the assessment cart, we have wireless devices to measure tripping hazards and linear measurements of features and sidewalk panels. We are now offering sidewalk assessment services throughout the US. This past year, BD completed sidewalk

assessments on 36 miles of sidewalk in Delray Beach, FL. We continue to assess college campuses and we have been actively seeking opportunities to provide assessment work for other agencies to help them prepare their federally required ADA Transition Plans for the sidewalk



environment. The PROWAP System received national recognition in a profile in the December 2013 issue of Wired magazine and an SBIR success story available at: https://www.sbir.gov/node/828741. BD plans to have an exhibit at the National ADA Symposium in Pittsburgh in June 2018. For more information about these services, visit

http://www.beneficialdesigns.com/products/trail-and-sidewalk-assessment-equipment-software/prowap

Airline Travel: Assistive Technology for Non-ambulatory Passengers

PVA Grant #3028

We completed a two-year grant funded by the Paralyzed Veterans of America (PVA) in collaboration with Jessica Presperin Pedersen, MBA, OTR/L, ATP/SMS; RIC, Chicago, IL. We are currently analyzing the data collected in order to create design concepts and establish design parameters for assistive technologies for non-ambulatory airline passengers who use complex

rehab wheelchair seating and mobility products. Specifically, this project focused on issues related to boarding wheelchairs, aircraft seating, transfers, and protection of wheelchairs during travel. BD performed IRB-approved human subject testing of

wheelchair users to evaluate existing boarding wheelchairs and aircraft seating to develop seating modifications and design specifications for improved comfort and safety of wheelchair users when traveling. The RESNA Standards Committee on Air Travel was formed as a result of this work.



Universal Design Guidelines for Fitness Equipment (UDFE)

NIH/NICHD SBIR Phase I Grant #1 R43 HD049236-01 RERC NIDRR Grant #H133E070029 & H133E120005 RERC NIDILRR Grants# 90RE5009-01

We have just completed year five of a second five-year RERC RecTech with the University of Alabama at Birmingham and are currently focusing on universal design criteria for specific equipment, such as bicycles and treadmills. This work is creating a set of internationally applicable



ASTM Standards on universal design specifications for the manufacturers of accessible fitness equipment. ASTM general (F3021/F3022), strength equipment (F2276/F2277), and elliptical (F2810/F2811) standards for UDFE specifications and test methods are now published and available through www.astm.org. A repeatability and reproducibility study of the color value contrast method in ASTM F3021/F3022 was presented at the 2016 RESNA conference:

www.resna.org/sites/default/files/conference/2016/outcomes/schnorbus.html. The RESNA Standards Committee on Inclusive Fitness was founded to develop disclosure guidelines, information, and/or formats to (1) disseminate information to the fitness industry that facilitates non-discriminatory access for people with disabilities and (2) develop an inclusive access mark to identify fitness facilities and equipment that meet access requirements for people with disabilities. This year, the committee drafted the

first volume of the Draft RESNA Standard for Inclusive Fitness Environments (IF-1). RESNA IF-1 went through a pre-ballot and is being revised per comments for an official RESNA ballot.

RESNA IF was highlighted on the NCHPAD website:

https://www.nchpad.org/1586/6601/Call~to~Action~~The ~Need~for~Fitness~for~People~of~All~Abilities

RESNA IF was highlighted in the July/August 2016 Access Currents (US Access Board's newsletter):

https://www.access-board.gov/news/access-currents-july-august-2016

Accessible Fitness Equipment and Facilities

RERC NIDILRR Grant# 90REGE0002-01-00

We have just started year one of a third five-year RERC RecTech with the University of Alabama at Birmingham, focused on implementing the research findings and standards developed in the previous RERC RecTech projects. We are working to identify factors that help and factors that hinder the adoption of universal design principles by exercise and recreational equipment manufacturers and public and private exercise and recreational facilities. We can use these findings to increase interest in universal design and encourage the usage of ASTM and ANSI/RESNA published standards to expand the accessibility of fitness environments for people of all abilities..

Development of Uniform Standards for Cognitive Accessibility

RERC NIDRR Grant #H133E090003 & H133E140054 The Coleman Institute for Cognitive Disabilities RERC NIDILRR Grant #90RE5019-01-00

We are in year four of a second five-year RERC for Advancing Cognitive Technologies (RERC-ACT) through the University of Colorado. This project houses the RESNA Standards Committee on Cognitive Accessibility (CA), whose goal is to develop universal design standards to increase product usability, such as cell phones and other consumer products. This work was presented at the 2011 RESNA conference, and is available at:

www.resna.org/sites/default/files/legacy/conference/proc eedings/2011/RESNA ICTA/kringen-69737.pdf.

The ANSI/RESNA Standard for Cognitive Accessibility – Volume 1: Universal Criteria for Reporting the Cognitive Accessibility of Products and Technologies is now published and available on the RESNA Website. RESNA CA is collaborating on international standards with

ISO/TC 173/WG 10 Assistive products for cognitive disabilities. RESNA CA meetings are open to all. For additional information, visit:

www.resna.org/standards/cognitive-technologiesct/cognitive-accessibility-ca www.facebook.com/CognitiveAccessibility

Wheelchair Standards

PVA & Beneficial Designs

As Secretary of the RESNA Standards Committee on Wheelchairs (WCS), Peter is the US delegate to the ISO Wheelchair standards work. BD conducts experimental testing to develop new test procedures to keep up with the development of new technologies. Peter is typically the only wheelchair user representing the voice of veterans and other wheelchair users at ISO international meetings. This is important since the RESNA national standards committee typically adopts the ISO standards in some form.

Adaptive Ski Equipment Standards

RESNA & Beneficial Designs

Peter is the Secretary of the RESNA Standards Committee on Adaptive Sports Equipment (ASE) develops specifications and test methods for adaptive ski equipment. A revision of the American National



Standard, RESNA ASE-1, was published in 2016. The committee meets each year in conjunction with the Ski Spectacular event in Breckenridge, Colorado in December. For more information, visit: http://www.resna.org/standards/adaptive-sports-equipment/adaptive-sports-equipment

Air Travel Standards

RESNA & Beneficial Designs

As Chair of the RESNA Standards Committee for Assistive Technology for Air Travel (ATAT), Peter is working closely with representatives from airlines, DOT, FDA, disability groups, and wheelchair manufacturers to draft standards related to air travel for people with impairments. The first volume will focus on specifications for power mobility devices designed for air travel, including information to be given to power mobility device users, manufacturing specifications, and guidelines on information and training for baggage handlers. Power wheelchairs and scooters currently available often sustain significant damage during transit, severely limiting the owner's mobility. Baggage

handlers are also at risk of injury due to unknown device weights and lack of secure, labeled lifting points. The proposed draft standard will address mobility device design, mobility device labeling, mobility device handling procedures, and dissemination of relevant information to people with mobility impairments. For more information on activities or membership, see:

http://www.resna.org/assistive-technology-air-travel-atat

AT Standards

RESNA & Beneficial Designs

As Vice-Chair of the RESNA Assistive Technology Standards Board (ATSB), Peter oversees the work of the RESNA Assistive Technology Standards (ATS) Committees. There are 11 ATS Committees that develop National ATS for the US, while harmonizing where possible with international standards, such as those developed through ISO. RESNA ATS are available for purchase through the RESNA store at www.resna.org.

Wheelchair Testing & Design

We continue to provide PDAC and VA testing and design services on a consulting basis for the manual and powered wheelchair industry. For more information, contact mail@beneficialdesigns.com

Wheelchair Training Guides

PVA Research and Education Foundation

The 2nd Edition of The Manual Wheelchair Training Guide is now available. The Powered Wheelchair Training Guide and A Guide to Wheelchair Selection provide wheelchair users and therapists step-by-step instructions for wheelchairs and negotiating various environments. These books are used as textbooks by professors teaching courses for future occupational and therapists. Paperback editions physical available directly through Beneficial Designs or through Amazon. PaxPress, a division of Beneficial Designs, is distributing the books electronically through Amazon and Nook. Contact paxpress@beneficialdesigns.com for more information or see our website at: http://beneficialdesigns.com/products/pax-press.

Canoe Seating System

NIH/NICHD SBIR Phase II Grant #2 R44 HD36944-02A1

The Universal Design Canoe Seat is now commercially available. The seat replaces or attaches to the existing bench seat in a canoe. It provides adjustable pelvic, back, and



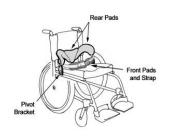
lateral supports to improve balance and comfort.

For more information, visit Creating Ability: www.creatingability.com.

HipGrip

NIH/NICHD SBIR Phase II Grant #2R44 HD36156-02A2

The HipGrip is a dynamic, spring-loaded pelvic support device for people who have difficulty maintaining pelvic positioning in their wheelchair. The HipGrip allows the user to lean forward and provides



variable resistance to assist the user back into an upright position. The HipGrip was being manufactured and distributed worldwide by Bodypoint. For more information, Google "HipGrip pelvic stabilization device."

FlexRim[®]

NIH/NICHD SBIR Phase II Grant #2 R44 HD36533-02A2

The FlexRim® is a compliant handrim that replaces the rigid interface between the wheelchair wheel and the handrim, reducing the gripping force and the impact forces. The FlexRim is manufactured by Spinergy and has been commercially available since September of 2007. For more product information, visit Spinergy: www.spinergy.com

PaxBac

NIH/NICHD SBIR Phase II Grant #2 R44 HD29983-02

The PaxBac is a lightweight back support that provides lumbar/ sacral back support on wheelchairs with sling upholstery. It will soon be manufactured by BES Rehabilitation, Ltd.

Expert Witness Services and Forensic Testing of Mobility Devices

As an expert on mobility devices, Peter Axelson has been able to help represent many claims based on evidence found in testing. Peter has been an expert witness throughout the United States and continues to support and represent both plaintiffs and defendants. To discuss a specific case or to learn more about Beneficial Designs' expert witness services please contact:

peter@beneficialdesigns.com.

Special Thanks & Acknowledgments

❖ Past Employees: Cameron Tolbert, Shop Assistant, graduated from high school and is now studying music at Concordia University Irvine. He recently performed (in choir and percussion) in a special program celebrating the 500th anniversary of the Protestant Reformation:

https://www.youtube.com/watch?v=6MLIX7yxJiM&sns=fb

Funding Agencies and other Acronyms:

CSA Canadian Standards Association
DOT Department of Transportation

ISO International Organization for Standardization NICHD National Institute of Child Health and Human

Development

NIDILRR National Institute on Disability, Independent

Living, and Rehabilitation Research

NIDRR National Institute on Disability and

Rehabilitation Research National Institutes of Health

NIH National Institutes of Health
NVRTP Nevada Recreational Trails Program
PTBA Professional TrailBuilders Association

PVA Paralyzed Veterans of America Research

and Education Program

RERC Rehabilitation Engineering Research Centers RESNA Rehabilitation Engineering and Assistive

Technology Society of North America

RIC Rehab Institute of Chicago

SBIR Small Business Innovation Research
USDA United States Department of Agriculture

Beneficial Designs Staff



Peter & Ria Axelson



Bill Blythe



Stephen Pieters



Paul Schnorbus



Allison Ansel



Seanna Kringen



Sam Schnorbus



Stephanie Schnorbus



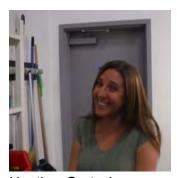
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Emery Schreckengost



Debbie Hester



Kyle Hollingshead



Ben Hubbard



Hannah Wetmore