design the unseen

INSTITUTE FOR HEALTH
IN THE BUILT ENVIRONMENT

UNIVERSITY OF OREGON

DESIGN THE UNSEEN

INSTITUTE FOR HEALTH IN THE BUILT ENVIRONMENT

Typically, architects and designers focus on designing physical space while scientists focus on understanding the unknown and unseen. Often, these lines of vision and discovery do not cross. In contrast, the *Institute for Health in the Built Environment* integrates designers, scientists and industry partners with diverse backgrounds to explore together the unseen elements of our built environment, including the indoor microbiome, air, chemistry, thermal and visual comfort, perception, psychologic and physiologic response, to understand how to better design for health, energy and evolution. We use science to design the unseen.

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DESIGN FOR HEALTH

INSTITUTE FOR HEALTH IN THE BUILT ENVIRONMENT

We understand and design for acute dangers in the built environment, such as requiring fire sprinklers; however, we don't often design for chronic dangers, such as low dose effects of indoor chemicals and contaminants or increased carbon emissions, because they are unseen. The effects are subtle, but destructive. They affect us through increased risk of cancer, inflammation, immunological disturbances, cognition, stress and a warming climate. The *Institute* is investigating and impacting the design of unseen elements in the built environment, from energy use to microbial ecology, chemistry, comfort, psychological perception, acoustics and carbon balance to improve human health.

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DESIGN FOR EVOLUTION

INSTITUTE FOR HEALTH IN THE BUILT ENVIRONMENT

Our habitat is changing. In the developed world, we spend more than 90 percent of our lives indoors, often in urban areas with little connection to natural systems in which humans evolved. Our built environment has evolved to be highly engineered, segregated from nature, and even virtual. Human biology has not evolved as quickly as built environments, which results in what evolutionary medicine has termed "mismatch diseases," diseases resulting from our ancient human biology adapting poorly to new environments. Examples include: allergies and autoimmune diseases due to reduced exposure of our immune system to good bacteria, diabetes and obesity due to environments in which we are more sedentary, or anxiety and depression from chronic stressors in our environment. The *Institute* is investigating our built environment to develop design strategies that reduce energy use while connecting us to an evolutionary past and healthy future.

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DESIGN ON THE FRONTIER

INSTITUTE FOR HEALTH IN THE BUILT ENVIRONMENT

On the frontier, you work together to create new opportunities and possibilities. This pioneer ethos is the foundation of Oregon's collaborative spirit and a reason we are successful at solving challenges. Climate change, population growth, diminishing resources and human health are challenges on the new frontier and we must continue to innovate solutions by working together to design for health, design for evolution and design the unseen. Collaborating with communities, municipalities, and academic and industry partners, the Institute for Health in the Built Environment advances, integrates, and applies new knowledge from diverse scientific disciplines to support a healthy, thriving community and planet.

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UNCONVENTIONAL DESIGN TOOLS

INSTITUTE FOR HEALTH IN THE BUILT ENVIRONMENT

Trace paper, thick black markers, wood models and coffee are indispensable in the genesis of an idea. However, many elements we experience in the built environment can't be seen. Whether energy, microbes, chemicals, or sound, the unseen has a profound impact on our own health, experience and energy use in the built environment. It's time we design for it. We have the unique toolsets to visualize, understand, simulate and shape it. These include: microbial DNA sequencing, metagenomics, gas chromatography, mass spectroscopy, climate chamber, wind tunnel, virtual reality and acoustic equipment.

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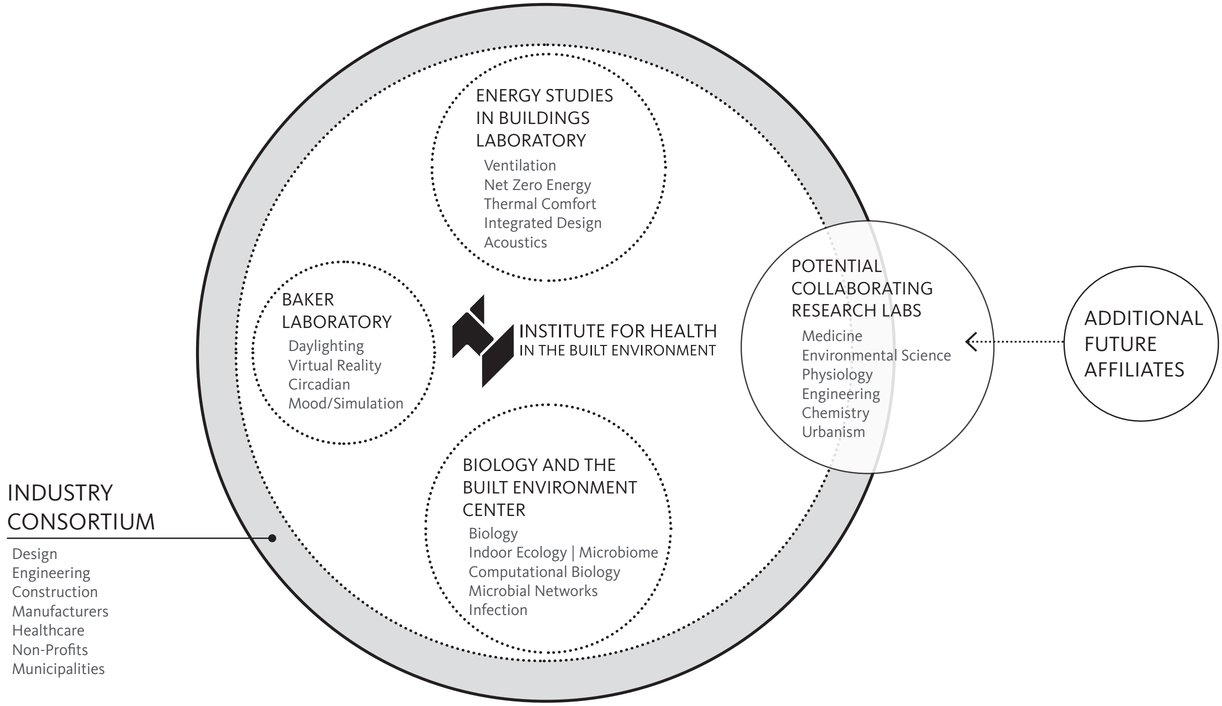
OUR VISION

In the developed world we spend 90% of our lives, and 40% of the total energy we consume, in buildings. Decisions we make about how buildings and cities are designed, constructed and managed have significant implications for our own health, and for the health of our planet. The Institute for Health in the Built Environment advances, integrates, and applies new knowledge from diverse scientific disciplines to support a healthy, thriving community and planet.

OUR MISSION

Our mission is to develop new design concepts for the realization of healthy and sustainable inhabited space. We do this by forming unconventional collaborations that conduct research where architecture, biology, medicine, chemistry and engineering intersect and translate it into design practice through a consortium of invested industry partners with applied impact.

OUR ORGANIZATION



OUR CURRENT COLLABORATORS

Harvard
Northwestern University
OSU Oregon State University
Tallwood Design Institute
Oregon Research Institute
Santa Fe Institute

INDUSTRY CONSORTIUM
INSTITUTE FOR HEALTH IN THE BUILT ENVIRONMENT

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UNCONVENTIONAL COLLABORATION

- Cross-disciplinary groups creatively re-examine larger problems and arrive at creative solutions
- Establish connections between world-renowned university researchers and leading industry partners
- Inform and help define research priorities
- Receive priority access to research results
- Translate research into products and services
- Accomplish more through synergistic skill sets and resources
- Develop research collaborations (Medicine, Chemistry, Engineering, Environmental Health Science)

MARKET DIFFERENTIATION

- Rapidly innovate and iterate to gain competitive advantage
- Differentiate your organization through association and access to knowledge and tools

COST EFFICIENCY

- Extend research investment through pooled research funds to improve ROI of new technologies, ideas, and practices
- Leverage university resources, industry partners, foundations, federal and state government
- Annual membership/sponsorship is less than the cost of a typical one year research project
- Potential benefit from federal tax credit
- Access to research grade scientific equipment

TECH TRANSFER

- Vett research by other industry members for likelihood of adoption and commercialization
- Manage Intellectual Property assignments and rights to benefit both industry partners and university researchers
- Patent rights & licenses - (negotiated) right to obtain a non-exclusive license on preferential terms to any invention conceived during the period of industry partner's support

HUMAN RESOURCE DEVELOPMENT

- Access resumes for graduates already engaged in the Consortium's work and projects
- Continuing education opportunities for staff

NETWORKING | BUSINESS RELATIONS

- Co-marketing opportunities
- Strategic networking and cooperation with other industries, companies, academia, and government agencies
- Long-term relationships and benefits that impact and outweigh specific project goals.

BECOME A PARTNER!

We can be hired as a consultant anytime; however consortium membership is an opportunity for partnership with ongoing dialogue and development of ideas ahead of your competition.

- Pioneer future research
- Attend consortium content meeting and board meeting
- Access to tools, calculators, guides and manuals
- Exclusive access to cutting-edge researchers and facilities
- Access to workshops, training and seminars

SUBSCRIPTION	YEAR 1	YEAR 2	YEAR 3	YEAR 4
MEMBER				
Tier 1 (Large Business)[1,2]	$35,000	$40,000	$45,000	$50,000
Tier 2 (Small Business)[1,2]	$15,000	$20,000	$22,500	$25,000
Tier 3 (A+E+C Firms)[2]	$5,000	$6,000	$7,000	$7,500
AFFILIATE	$2,500			

[1] Large/Small business designation determined by SBA Table of Small Business Standards
[2] 12% Multi-year discount available

RECENT PUBLICATION

INSTITUTE FOR HEALTH IN THE BUILT ENVIRONMENT

VENTILATION | MICROBES

Kembel, S.W., et al. (2012). Architectural design influences the diversity and structure of the built environment microbiome.International Society of Microbial Ecology (ISME) Journal 6:1469–1479. doi:10.1038/ismej.2011.211.

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INDOOR VISUAL COMFORT | DAYLIGHT PERFORMANCE

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Andersen, M., et al. (2013). Beyond illumination: An interactive simulation framework for non-visual and perceptual aspects of daylighting performance. Presented at the BS2013 - 13th International Conference of the International Building Performance Simulation Association.

Dyke, C., et al. (2015). Comparing Whole Building Energy Implications of Sidelighting Systems with Alternate Manual Blind Control Algorithms. Buildings, 5(2), 467–496. https://doi.org/10.3390/buildings5020467

Gormly, K., et al. (2016). Can we use smartphone-imaging sensors as low cost luminance mapping tools to support design processes, integrated lighting system control and human factors research? Presented at the IES Annual Conference, Orlando, FL.

Jakubiec, J., et al. (2015). Towards an integrated framework for predicting visual comfort conditions from luminance-based metrics in perimeter daylit spaces. 14th International Conference of the International Building Performance Simulation Associate, Building Simulation.

Jakubiec, J., et al. (2016). Improving the Accuracy of Measurements in Daylit Interior Scenes Using High Dynamic Range Photography. Presented at the Passive and Low Energy Architecture (PLEA) Conference, Los Angeles, CA.

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Nezamdoost, A., et al. (2017). Revisiting the Daylit Area: Examining Daylighting Performance Using Subjective Human Evaluations and Simulated Compliance with the LEED Version 4 Daylight Credit. LEUKOS, 13(2), 107–123. https://doi.org/10.1080/15502724.2016.1250011

Nezamdoost, A., & Van Den Wymelenberg, K. (2016). Sensitivity study of annual and point-in-time daylight performance metrics: A 24 space multi-year field study. Presented at ASHRAE and IBPSA-USA Sim Build 2016 Building Performance Modeling Conference Salt Lake City, UT.

Nezamdoost, A., et al. (2014). Annual energy and daylight impacts of three manual blind control algorithms.

Rockcastle, S. F., et al. (2017). A Simulation-Based Workflow to Assess Human-Centric Daylight Performance. In Proceedings of the 8th Symposium for Architecture and Urban Design. Lausanne, Switzerland.

Van Den Wymelenberg, K. G. (2014). Visual Comfort, Discomfort Glare, and Occupant Fenestration Control: Developing a Research Agenda. LEUKOS, 10(4), 207–221. https://doi.org/10.1080/15502724.2014.939004

Van Den Wymelenberg, K., et al. (2013). The Effect of Luminance Distribution Patterns on Occupant Preference in a Daylit Office Environment (Vol. 7).

Van Den Wymelenberg, K.G., & Inanici, M. (2016). Evaluating a New Suite of Luminance-Based Design Metrics for Predicting Human Visual Comfort in Offices with Daylight. LEUKOS, 12(3), 113–138. https://doi.org/10.1080/15502724.2015.1062392

DAYLIGHT | MICROBES

Fahimipour, A.K., et al. Daylight exposure modulates microbial communities associated with household dust. (In review)

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Adams, R.I., et al. (2016). Ten questions concerning the microbiomes of buildings. Building and Environment doi: 10.1016/j.buildenv.2016.09.001.

Alivisatos, A.P., et al. (2015). A unified initiative to harness Earth's microbiomes. Science 350 (6260): 507-508, doi:10.1126/science.aac8480.

Blaser, M., et al. (2016). Toward a Predictive Understanding of Earth's Microbiomes to Address 21st Century Challenges. mBio 7:3e00714-1.

Brown, G.Z., et al. (2016). Making microbiology of the built environment relevant to design. Microbiome 4:6 doi:10.1186/s40168-016-0152-7.

Emerson, J.B., et al. (2017). Schrödinger's microbes: Tools for distinguishing the living from the dead in microbial ecosystems. Microbiome 5:86. doi: 10.1186/s40168

Hsu, T., et al. (2016). Urban transit system microbial communities differ by surface type and interaction with humans and environment. mSystems, 1:e00018-16. doi:10.1128/mSystems.00018-16

Kembel, et al. (2014). Architectural design drives the biogeography of indoor bacterial communities. PLoS ONE doi: 10.1371/journal.pone.0087093. [featured in Fast Company, Wired, The Atlantic, The Scientist]

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INSTITUTE FOR HEALTH IN THE BUILT ENVIRONMENT

Mhuireach, G., et al. (2016). Urban greenness influences airborne bacterial community composition. Science of the Total Environment http://dx.doi.org/10.1016/j.scitotenv.2016.07.037.

Pastore, L., et al. (2016). Assessing the impact of contemporary urbanization on bioclimatic features of historic architecture through a two-step simulation process. Proceedings of PLEA 2016. Retrieved from https://infoscience.epfl.ch/record/218598

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Vandegrift, et al. Cleanliness in context: reconciling hygiene with a modern microbial perspective. Retrieved January 5, 2018, from https://microbiomejournal.biomedcentral.com/articles/10.1186/s40168-017-0294-2

DAYLIGHT | ENERGY

Andersen, M., et al. (2013). Human Response in Daylit Spaces. Presented at the Colour, emotion and well-being. Retrieved from https://infoscience.epfl.ch/record/199757

Nezamdoost, A., & Van Den Wymelenberg, K. (2015). A Comparative Study of Spatial Daylit Area Drawings with Annual Climate-based Simulation Using Multiple Manual Blind Control Patterns, and Point-in-time Simulation. Presented at 2015 ASHRAE Energy Modeling Conference: Tools for Designing High Performance Buildings, Atlanta.

ENERGY EFFICIENCY

Acker, B., & Van Den Wymelenberg, K. G. (2012). Plug load energy profiles and energy saving interventions in office environments. In 2012 Summer Study on Energy Efficiency in Buildings.

Brown, G. Z., et al. (1992). Energy Design Software for Industrialized Housing. Presented at the 17th National Passive Solar Conference, Cocoa Beach, FL.

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