SCIENTIFIC DESIGN INSIGHTS

Flad

SCIENTIFIC DESIGN INSIGHTS

EXPERT ADVICE, PROVEN DESIGNS, AND STORIES TO INSPIRE

LOOKING THROUGH THE GLASS

WHAT'S NEXT?

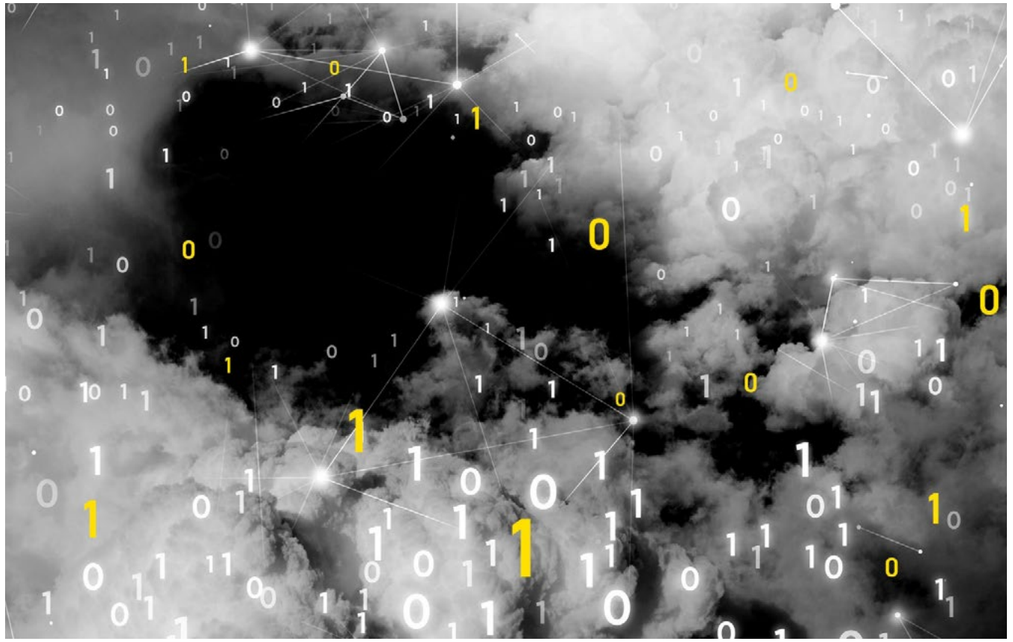
The world of scientific research is inherently marked by change. New discoveries and advancing technology open new doors and possibilities. Through those doors are new challenges and changing needs for research space, equipment, safety, and well-being. In the following pages, we'll share insights, expert advice, and new designs to inspire your research environments and help you plan for the future. You'll also learn about emerging trends, balancing costs, improving efficiency, and supporting your people. We invite you to join us as we design a better future together.

CONTENTS

THE HYPOTHESIS

CONVERSATIONS ON SCIENTIFIC RESEARCH ENVIRONMENTS

As part of an ongoing series, we recently sat down with members of Flad's science and technology team to discuss the future of scientific research environments.



LABS AS DATA ENGINES, MINIATURIZATION, THERANOSTICS, AND REAL-TIME MEDICINE FULFILLMENT

WITH PAUL HANSEN

Q: What are some of the challenges and technologies that scientific organizations are talking about?

A: With remote work, I think we're living in a world where we're not going to return to what we used to think was normal. The definition of the new normal will vary by organization and its business focus.

During the pandemic a number of biopharma clients shared that research staff remained on site to support lab research activities. Correspondingly, other organizations shared that they allowed researchers focused on the development of combination products such as medical devices, which typically occur in dry or electronics lab environments, to work remotely and connect virtually with colleagues.

In terms of emerging technologies, one rapidly evolving technological platform is the growth and use of connected analytical equipment arrays focused on the digitalization of research with the goal of leveraging machine learning (ML) to accelerate drug discovery.

For example, companies such as Strateos have reimagined the laboratory as a smart data generation center using high-throughput lab (HTL) automation. Connected analytical equipment arrays to support this research digitalization are now being incorporated into traditional lab environments. The need to incorporate in-facility data centers to support the data generated is often requested to support labs as data engines.

Building on the construct of HTL analytical arrays, computational biology and bioinformatics is another advancing disruptive technology. This has resulted in the ability to rapidly generate testable hypotheses at a faster rate than we can test those hypotheses in the laboratory. Projects like the Department of Energy's (DOE) KBase and others are integrating masses of data in environments that can support comparative analysis, hypothesis generation, and model formulation and testing, virtually. These technologies also leverage the use of microfluidics involving tiny amounts of fluid – only tens of micrometers across.

The premise is to advance the miniaturization of this technology via microfluidics, or a 'lab-on-a-chip' (LOC), and automate them via advanced control and machine learning the scientific protocols of most importance.

Per the DOE, "These advancements, when taken together, hint at the possibility of a revolution in biological science if we can overcome the latency of traditional approaches to wet lab experimentation. Inspired by the example of the DOE nanoscience centers, the idea is to develop a network of HTL labs, each focused on a complementary set of protocols and technologies needed by the systems and synthetic biology communities."

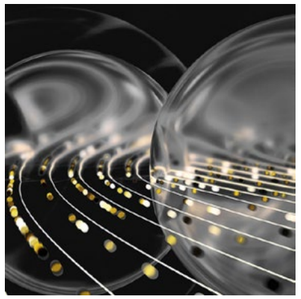
Machine learning to enable research is a rapidly expanding focus of academia. For example, Carnegie Mellon University, in conjunction with Emerald Cloud Lab, is building a remote-controlled lab that will allow for all aspects of daily lab work to be fully operated remotely.

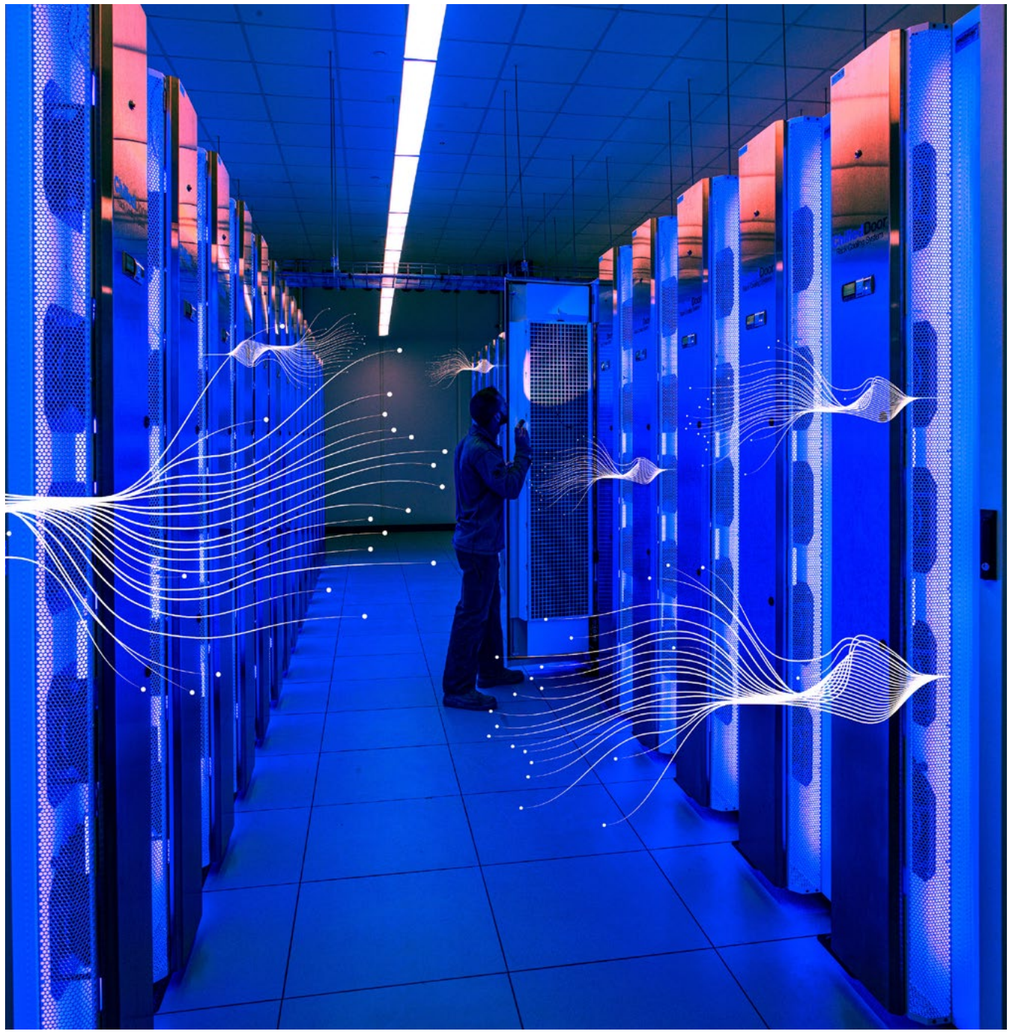
In the context of drug discovery, additional technology areas that pique my interest are artificial intelligence (AI) and machine learning information technology applications. These applications are rapidly expanding in use by corporate research, academia, and other organizations. This has resulted in research organizations establishing dedicated AI/ML core teams whose focus is advancing the speed to market of life science discovery and development. For example, companies like BenevolentAI have built an AI-enabled drug discovery platform, which is revolutionizing drug discovery speed to market.

It's also worth noting theranostics, which is a combination of the words therapeutics and diagnostics. In the field of medicine, theranostics involves drugs and/or techniques that are uniquely combined to diagnose and treat medical conditions simultaneously or sequentially. For cancer research and prevention, radioisotopes and/or viruses are engineered to attack cancer cells and stimulate the patient's immune response. Globally, the theranostics market is estimated to increase from $96.7M this year to $172M by 2028, a projected annual growth rate of 12.2% over the next five years.

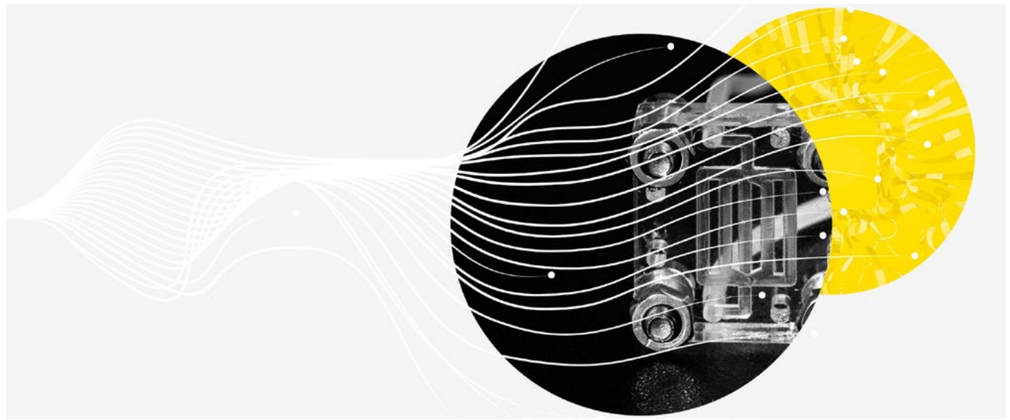
PAUL HANSEN
AIA, LEED AP
PRINCIPAL

Paul's years of managing research facilities have given him unique insights into the questions asked by clients and their probable motivations – the questions behind the questions. Understanding their methods, he can find the ways in which their approach and the approach of the design team align. A project leader and client advocate with extensive experience on both sides of the fence, he's a calming influence – listening, providing counsel, and delineating solutions that enable business, helping advance conversations to positive outcomes.





> **Research facilities of the future may consist of physical or virtual data modeling functions combined with discrete core labs, including both specialized and more conventional, complementary research lab cores.**



Q: What do you think a lab will look like in the next 10 or 20 years?

A: I believe the convergence of current and emergent scientific equipment instrumentation and the digital transformation of science will influence and reframe traditional lab and drug manufacture environments. Moreover, the incentives associated with accelerated drug candidate development and manufacture that will be fueled by digitalization will disrupt traditional real estate/facility organizational/functional constructs. Further, I don't envision a future horizon where conventional in-vivo lab environments are no longer required. In contrast to the research facilities of today, where we see broad swaths of labs that are focused on discovery and development, research facilities of the future may consist of physical or virtual data modeling functions combined with discrete core labs, including both specialized (e.g., imaging, next-generation sequencing, etc.) and more conventional, complementary research lab cores including biology, chemistry, genomics, and physical materials analysis/characterization.

Lastly, while I'm on this scientific workplace of the future theme, advances in digital and LOC technologies present the possibility of bringing a miniaturized, multi-modality research instrument to the user via a desktop microisolator. Predominantly, if tomorrow's labs are data engines where both clinical and analytical data are accessed via an open-source cloud platform and paired with LOC instrumentation, it suggests that scientific discovery, as primarily a virtual activity, may be agnostic to environment and location.

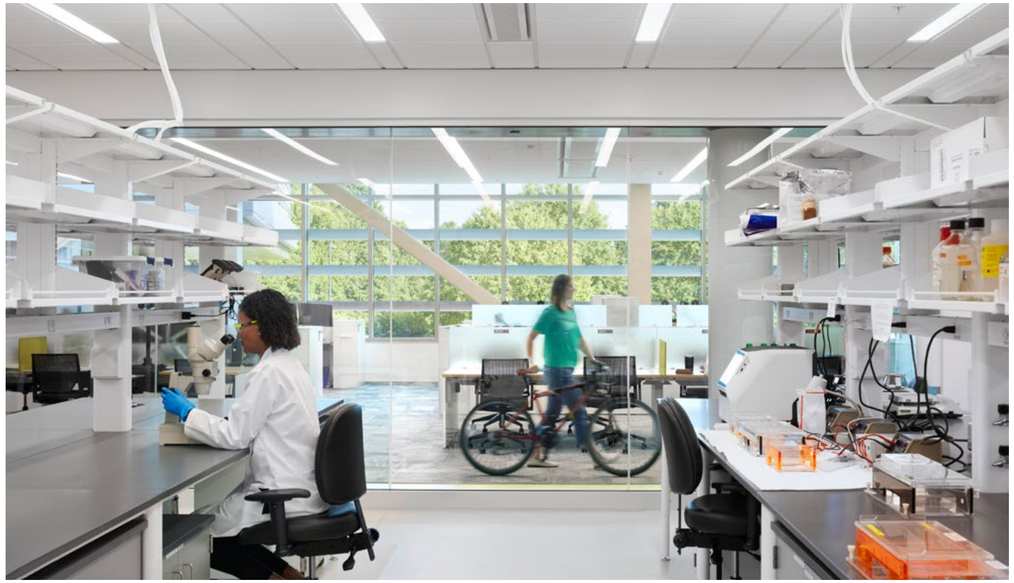
Q: How would that impact lab use and the planning and programming for labs?

A: The promise of virtual labs suggests operational benefits attributed to a reduction in physical lab space or a facility degrowth strategy. Potentially, this suggests operational savings attributed to energy consumption, overhead and maintenance, and asset depreciation.

Q: What are some future applications of the things you've described?

A: The range of systems and approaches that can be used to deliver medicines is growing and advancing at an incredible rate. Coupled with the rapid growth in bioinformatics and technology, it suggests the future is being created now. Future applications present what-if opportunities for just-in-time, on-demand fulfillment of medications.

Today, due to the advancement of technology, 3D-printed organs have become a reality. The next big hurdle is the implantation of bio-printed organs into humans. Similarly, is it possible to see similar clinical-care disruption to compounding pharmacies that custom-make medicines? Informed by telemedicine, imagine a time in the future where personalized, custom-made medicines are dispensed to the patient via direct dispensing – a vending machine.



BUDGETING AND ADVOCATING FOR SUSTAINABILITY, DESIGNING FOR WELLNESS

WITH KIM REDDIN

Q: What are some of the biggest trends/challenges clients are asking about?

A: From my vantage point the biggest trend, and also challenge, is the effort our clients are making to drive down their greenhouse gas emissions, waste generation, and water consumption. Historically, all those things have been high in the world of research because of safety protocols, and the operational procedures required to run a lab safely and effectively have been, in some ways, diametrically opposed to having a minimal environmental footprint.

But I think everybody recognizes that we can't just keep operating the same way we always have because it's causing significant environmental issues. Our clients are really grappling with keeping their labs running safely, not compromising the science for the sake of sustainability, while at the same time, finding ways to implement different operational practices that reduce their footprint.

Because the amount of pollution and environmental damage we've seen thus far is having an impact on weather and climate disasters, the other trend I'm also seeing more of is the concept of resilience planning. This past year has been pretty demonstrative of some of the challenges we'll be dealing with moving forward. We had major heat waves in parts of the world, droughts, flooding, and the wildfires in Canada caused days with terrible air quality here in Madison, as well as other parts of the country.

So, I think resilience is starting to be more top of mind for our clients, trying to understand what they can do to not only be more sustainable, but to make their organizations more resilient. Some of our clients are taking it a step further and working to make their communities more resilient, which I think is really admirable.

Q: From a sustainability standpoint, what is the biggest lab planning and programming challenge you've encountered recently?

A: I think everything seems to be moving in the right direction, but is it moving fast enough? That's my big concern.

One of the biggest challenges right now is I'm not seeing the lab-specific finishes, equipment, and furniture keep pace with general industry progress. A lot of manufacturers focused on lab materials and products have not seen a big demand for sustainability purchasing criteria, so we find ourselves trying to advocate for more options or transparency data. Innovation in labs can be another challenge – we work on a lot of critical facilities, so we need equipment that can reduce operational emissions but is also field tested and proven to work.

In some instances with lab finishes and furniture, we're the first to ask a manufacturer to share their VOC emissions evaluations. If the market doesn't appear to have a demand from their perspective, then the products won't keep pace. Whereas when we look at office materials, that's not a problem. Sustainability with office spaces has been a big deal for 20-some years now, but with labs, I think we're just starting to get there.

So, I think the challenge is making sure manufacturers know that we want materials and equipment for labs that incorporate healthier materials, contribute to a circular economy, and have reduced embodied and operational emission impacts. If they recognize that the demand is out there, I'm confident manufacturers will help us achieve these things.

Q: What reactions are you seeing from clients in terms of the financial aspect if some of these new technologies or sustainable solutions are not yet the most cost-effective choice?

A: I've definitely been beating the drum lately that this needs to be talked about in the strategic or master planning phases before we actually have a building, so when a client is planning on funding a building project, it's built into the budget.

If the client already has the funding in place and the funding does not reflect a building that's highly sustainable, there are best practices we can implement that are cost neutral and we can make work on a relatively limited budget, but there's not that much that we can do to really take it to that next level.

On some projects, we're looking at on-site renewables, energy-reduction strategies, and water-reduction strategies that can add several million dollars or more in additional costs, depending on the project size. It's not a small cost if you want to really take it as far as you can. So, it really needs to be built into a project budget, and the only way that happens is if you plan for it up front.

KIMBERLY REDDIN
AIA, LEED AP BD+C, WELL AP
PRINCIPAL, DIRECTOR OF SUSTAINABILITY

Kimberly believes that as architects, we have a responsibility to our clients, users, and communities to create beautiful, high-performing, healthy environments. She has dedicated her career to advocating for and building sustainable architecture that fulfills this responsibility. The driving force behind her work is the belief that good design improves communities and helps both current and future generations to flourish.

Q: What trends are you seeing from a policy standpoint? Anything that you expect to see more of?

A: One of the things that we're tracking is individual municipalities that are adopting stronger energy codes and other sustainability-related codes.

We see it more on the East Coast and the West Coast. California has CALGreen, which was one of the codes that helped lead the way for states to start adopting more stringent requirements around energy code and materials. New York City has Local Law 97, which will require buildings over 25,000 square feet to start meeting energy efficiency and greenhouse gas emissions criteria.

I think we'll see more and more of that. If individual municipalities don't feel their states are upgrading codes quickly enough, then I think they'll take it upon themselves to create their own codes or adopt stretch codes if they can. I think, especially on the coasts, we'll continue to see some big progress in local policy that will drive things forward and that will eventually help everyone out.

Getting back to those manufacturers seeing a market demand, if manufacturers have a product you can't specify for a project in California or New York because it doesn't comply with code restrictions, then that requires them to evolve because those are two major markets that you don't want to be eliminated from because you don't have a compliant product.

Q: We're starting to see more buildings designed with all-electric utilities. Do you think that is the direction everything is headed?

A: I think so. Again, getting back to emissions, Scope 1 are the emissions generated directly by an organization, such as emissions from a gas boiler, while Scope 2 are emissions from purchased energy, likely the local utility provider. If you can eliminate everything on site that burns fossil fuel, then you've eliminated Scope 1 for the building, which is a big goal for a lot of entities.

Meanwhile, as your utility provider's grid gets cleaner, your Scope 2 emissions decrease. If you can procure carbon-free electricity for the building, then you can eliminate both Scope 1 and 2 emissions, which is a really big deal for labs.

Then Scope 3, I always say, is like the white whale because it's everything else and hard to track, but companies are doing it.

So, I do think electrification is where we'll be headed. It's still a challenge in labs because we're just not fully comfortable with the electrified versions of some equipment yet. The other thing is sometimes it takes quite a bit of electrical power to run a piece of equipment, so it can be more expensive and potentially generate more emissions if the electrical power procured is not very clean.

Let's say you're in Madison, and you electrify everything, not only is it more expensive, but you might actually see higher emissions because our grid is not very clean. So that becomes a balancing act to determine the right thing to do based on where we are today. You need to look at what the utilities are doing and where we're going to be in a few years and ask what's really the most sustainable choice? Because unfortunately, it's not always what you think it'll be when you do the math.

But if you're in San Francisco or Seattle right now, going all electric, from an emissions standpoint, makes a lot of sense because the grids are getting cleaner and cleaner. Then your emissions are drastically reduced.

Q: How do you envision a lab will be different 10 or 20 years in the future?

A: One of the things we talk about a lot is wellness. Thinking about the labor shortage we might face in the future and the way people approach work today, I think it will be critical that we design or renovate buildings to really take wellness into account.

We should be thinking about mothers' rooms, respite spaces, physical accessibility, and neurodiversity. Do we have enough daylight, and is it good daylight? Looking at the materials we're putting into a building, are there chemicals that we really shouldn't be exposing people to?

I think we're starting to get better and better data around that, and now there are more readily accessible air quality monitors. We installed air quality monitors in our San Francisco office, and we can monitor what activities seem to cause VOCs to spike and what we can do to try to make sure everyone has the best air quality possible.

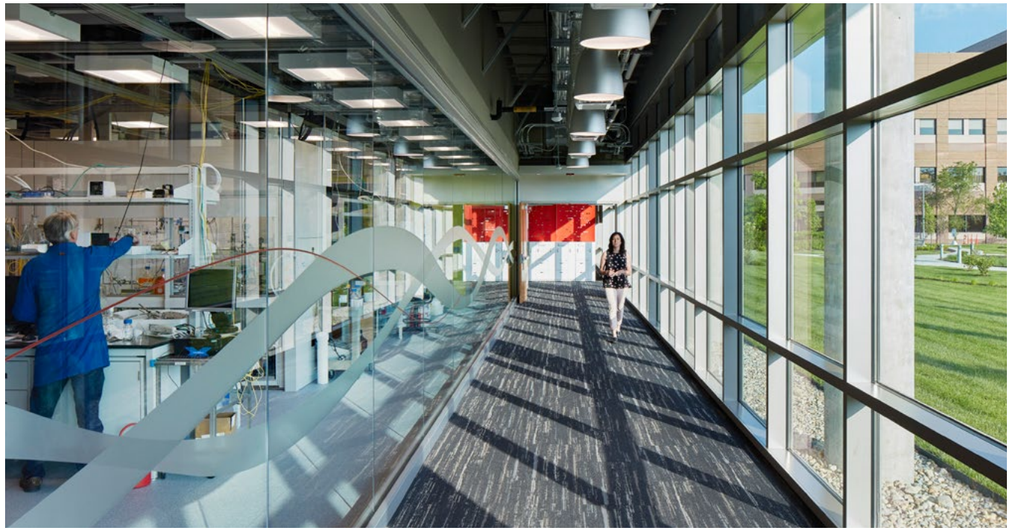
All these technologies and design approaches are evolving, and I think that they'll continue to evolve along with the sustainability component because they're all tied together.

When I imagine the lab of the future, in a utopian vision, I imagine biophilic materials: wood, plants, green walls, great views, a sense of community and connection – all things that make a person feel as healthy and happy as their environment can help them feel.

I think that's really part of what design is going to turn into. A decade ago, labs felt much more sterile and focused only on function.

Flad has done a great job to bring a sense of beauty and design into even the most technically and functionally challenging labs so that there is that sense that a human occupies the space and should be accommodated.

I'm really hopeful that this trend is going to continue, and we're going to see labs that are focused not just on science, but the wellness of the lab occupants.



> **Thinking about the labor shortage we might face in the future and the way people approach work today, I think it will be critical that we design or renovate buildings to really take wellness into account.**

Q: The younger generations seem likely to push that trend forward.

A: I agree, and the research is there. When my parents started working, I don't think anybody cared that much whether workers were happy, if their job was fulfilling, or if the spaces they occupied were healthy for them.

I don't think anyone considered that sitting in a room all day with no windows and fluorescent light bulbs might be detrimental to your health. Whereas now we have all sorts of research that indicates that just isn't good for anybody, and the good thing is that healthy design is synergistic with sustainability. I think if these things continue to evolve together, we should continue to see some beautiful science spaces.

PLANNING FOR THE UNEXPECTED, AUTOMATION, AND THE NEXT GENERATION

WITH ROSS FERRIES

Q: What are some trends and challenges that you are hearing from clients?

A: I've been personally working with a few clients who, because of the pandemic, want new space for infectious disease research, whether it's to specifically research COVID or to replace labs that were overtaken by COVID research. The pandemic seems to have created new awareness of how infectious disease can impact our daily lives.

Flad has worked with clients who are trying to put BSL-3 labs into existing facilities that weren't initially planned for them. That may not be the biggest industry trend, but in my experience, it has definitely increased.

Even if an institution or individual researcher isn't working specifically on COVID as a research focus, it certainly made everyone more aware that things can change quickly in our world. The idea of ensuring facilities are prepared and having a budget with the flexibility to make rapid changes is something that's more top of mind.

Q: Are there any specific challenges when transitioning to these higher containment labs?

A: For a recent academic project, we designed, built, and shelled out some fairly basic research labs that were mainly intended for neurological research. After the building went up, the client decided that they wanted to put in a BSL-3 program. That can be a significant challenge when you don't have the service space that you normally associate with a Level 3 lab.

We reached a good solution by collaborating among the users, the client's safety and operations personnel, and our engineering team to come up with a way to safely service the lab without compromising their program space too much because it takes a lot of service space to run a containment lab.

Q: How are hybrid work models and people not necessarily going to the physical office every day influencing the way that you're planning labs?

A: I think Flad has quickly adapted and adjusted as needed without drastically overhauling our offices, and our clients are at the same point in their thinking. I haven't heard clients say we have 100 people, but we only need 40 spaces for them. They may want smaller workspaces per person, but the idea is still that if a person needs a desk, they will have their own desk.

Some lab workers need to be in the lab for a couple hours and at their desk/office for a couple hours and go back and forth throughout the day, so I don't know that working from home will eliminate the need for lab space and offices.

In fact, research labs will continue to move towards more computational space versus wet lab space. Space allocated to labs may be reduced, and the office or the places where they do computational or data research will increase in size. Whether that means people just have more space at home to work or there's an increase in office space in the research buildings, that is something that we'll see evolve over the next 10 years.

Q: What other emerging trends have you seen?

A: I've seen increased large-scale and small-scale automation in labs. On a project Flad is working on now, they're using robots to do a lot of the manual, repetitive tasks. There's more automated equipment for moving materials around the building instead of assigning people to those tasks. I think we'll see this trend continue.

Q: How does that impact planning and programming?

A: On one project specifically, the client has a separate, dedicated planning team for the robots. We have Flad's team of planners, but then we're also working with a team whose objective is to help the client determine what robot systems to use.

The needs of a robot moving through a space are different when it comes to things like going through doorways that might require security clearance or determining where they go in the event of a fire alarm situation. You need to plan for a safe place for them to go and not be stopped in the middle of a fire or blocking walkways. It's not necessarily the biggest factor on planning, but it is an entirely different user group to think about.

ROSS FERRIES RA
SCIENCE PLANNER

Ross has over 20 years of experience in the field of architecture and design, with a depth of planning knowledge in science and technology and academic projects. As a planner he has extensive, hands-on laboratory facility programming, planning, and design experience on new construction, renovation, and master planning projects.

> **There are a lot of ideas about openness and flexibility that now, rather than trying to convince people of the benefits, we're hearing those requests from younger researchers.**

Q: In what ways are you seeing a push for sustainability in lab and research facility design?

A: I've noticed there are different motivations. Some clients truly aspire to be environmentally responsible. Some may be more interested in the energy savings on operating costs, and a lower environmental impact is an added benefit to that. For some clients that have prominent public profiles, they want to be not only environmentally responsible, but they also want to be seen as good stewards of the environment.

That could mean they not only want to have PV panels, but they want to have the panels in a highly visible spot where they can be seen when you drive past the building. When their employees come to work or visitors come, they'll see that they're doing these things.

No matter the reason, it encourages people to pursue more sustainable design solutions and inherently becomes part of their culture.

Q: How might the younger generations influence scientific workplaces in terms of design?

A: I am already seeing younger researchers wanting things that we as planners started to recommend 10-20 years ago. That includes ideas such as more open, flexible space and having equipment and benches that can easily be reconfigured overnight.

Those are ideas that we recommended and encouraged clients to consider, and now younger researchers ask me about those things because they've worked in or toured more modern places where they've seen these features.

As a result, there are a lot of ideas about openness and flexibility that now, rather than trying to convince people of the benefits, we're hearing those requests from younger researchers.

I can imagine students in school now are working half the time online and using their phone as often as the computer. When they enter the workforce, they may want a workspace that will be inherently hybrid where they can be at a desk, on their couch, or in the lab. I think they will want a wider variety of spaces and ways to work than the labs currently provide.

In 20 years, someone might not even want to sit at a desk. It's been said that sitting is the new smoking. In the future, if you tell someone that they have to work at a desk, maybe they'd rather be doing their data input while they're standing or on a treadmill. With labs trending towards becoming a computational space, computational space might need to evolve from just a desk with computers to something more stimulating.

MAXIMIZING LAB FLEXIBILITY, EFFICIENCY, AND REMOTE COLLABORATION

WITH RUSS DRINKER

Q: What is one of the biggest lab planning and programming challenges you've encountered with a client recently?

A: We've seen clients completely change programs as well as building users and their location while projects are under construction. The typical project takes one year to design and permit and two years to build. In those three years, many things can change for our clients. They may have different entities, different researchers, different labs, or different equipment.

Organizations don't want to put themselves in a position in which they need to make drastic changes immediately after occupancy, so they are opting for just-in-time planning and making those decisions at the latest possible date.

This is an important trend that we're seeing, and it happened recently both with a 500,000-square-foot project and a 250,000-square-foot project.

The solution is to maximize flexibility of labs. This includes open ballroom space with utilities in the ceiling and mobile benches. The equipment and benches can be moved around with plug-and-play connections. Even larger instruments, such as fume hoods and large, enclosed robots in clean enclosures, can be accommodated in these flexible labs with minimal need to redesign, re-permit, and rebuild conceptually.

It's critical to provide these flexible spaces but also balance the upfront investment in that flexibility. Organizations don't want to overspend on infrastructure that won't be utilized in the long run, so it's important that we strike that balance at the very beginning of the project, to provide flexibility at a justifiable investment level.

Q: In addition to more flexible spaces, what are some other trends you're seeing in scientific workplaces?

A: Because of the increasing reliance on robots and automation, a lot of work can now be monitored remotely, so scientists don't need to be tethered to the bench all day long. Researchers can monitor their experiments remotely, but we will continue to see scientists spend a substantial amount of their time in the lab setting up the experiments.

Another big trend is related to reducing energy costs and reducing carbon footprints. Labs have traditionally relied heavily on high levels of constant air changes to dilute and remove chemical buildup and hazardous air. It takes a lot of energy to treat the air to maintain humidity levels and temperature, and then it's just exhausted out. We're seeing increased efforts to address that inefficiency without compromising health and safety.

So, we have rapidly changing equipment and increasing emphasis on health and well-being of the scientific staff, all while doing everything we can to reduce the energy and carbon impact.

Those goals aren't all necessarily aligned. In fact, they might be counter-directional in some ways. And that's the challenge.

Q: With that in mind, what types of changes do you expect to see in the design of labs over the next 10 or 20 years?

A: I think the biggest change that we're going to see is more precise and targeted ventilation systems, which are actively monitoring the quality of the air. Right now, it's a blind instrument. It's like running the fire sprinklers 24/7 because somebody might light a match. That's extremely inefficient.

We're managing these huge volumes of air, tempering them, and then ejecting them out because there might be some chemicals in the air. But the reality is that most of the time the air is safe, and the air changes are excessive. These new systems sense the composition of the hazardous materials in the air and ramp up the air changes when needed to exhaust the air and ensure occupants are safe.

The reason this approach is not more prevalent yet is that there are so many different chemicals in use, and cost-effective sensors don't yet exist for all those chemicals with our current technology. We've seen rapid development in this area, and I think we'll see much more reliance on sensors and technology to moderate the air levels based on the detectable hazards.

SmartStack does this at the building exhaust level, but not at the lab level. That's the safest technology to use right now. SmartStack will ramp the exhaust fan speed up or down depending upon the level of contamination detected in the building exhaust air, then it reduces fan speed and related energy costs when the air is safe.

RUSS DRINKER
AIA, LEED AP BD+C, WELL AP
DIRECTOR OF WEST COAST SCIENCE & TECHNOLOGY

As the leader of Flad's West Coast Science & Technology practice, Russ is passionate about reshaping the built environment for a better future. Committed to discovering improved design outcomes through effective partnerships, he has led award-winning interdisciplinary design firms and major projects, combining practice building with high-performance design.

The Aircuity system senses and manages the air changes within the lab space and is a good option for classrooms and manufacturing where there is a predictable type of chemical being used. However, in a research lab, there can be a much wider variety of chemicals in use, and there aren't necessarily sensors in place for all of them yet, so that's a rapidly changing area.

The other thing that we'll be seeing more of is preassembled modular utility racks, PAMs. Off-site assembly and prefabrication reduces labor costs and improves the quality of the workmanship. It's a different delivery model that allows more flexibility in the long run, so utilities are organized to be more accessible and to be more easily modified to achieve cost savings over the life of the facility.

We're just beginning to see the economies of scale for PAM systems becoming adequately competitive with the traditional on-site assembly. I think in five years, a much higher percentage of our work will involve these systems.

Q: Thinking about remote or hybrid work environments, how is science being delivered in new workplace models?

A: I'd say the most important thing is there are networks of collaborators. It's no longer just people within a four-wall lab environment. Researchers are able to use technology to network with collaborators all around the world, and I think the definition of workplace no longer means being tethered to the bench. Now that scientists can monitor activities at the bench remotely using technology, they are not spending as much time in the lab, and it's an increasingly collaborative enterprise.

We recently conducted a post-occupancy evaluation with a client, and she said the number one question asked by job applicants, including scientists, is if they can work remotely. So, I do think that we'll increasingly be designing labs with the understanding that the time in the lab will be reduced.

Q: What is the potential impact of a hybrid work environment and researchers spending less time in the lab?

A: Scientists still need to be in the physical space to set up their research, but once it's set up and running, they are often able to monitor it remotely.

I think the risk is that these undertakings are collaborative, and if it becomes siloed, many potential approaches to a problem will not be enriched by the incidental conversations that might casually occur with somebody over lunch or in a hallway.

So many discoveries are not intentional or by the original design. They were opportunistic based on conversations and then cross-fertilizing based on different skills, specialties, and interests. That's what I think is at risk, potentially, if people aren't collocated.

> **We're just beginning to see the economies of scale for PAM systems becoming adequately competitive with the traditional on-site assembly.**

NATIONAL LABS, PLANNING COLLABORATION, AND THE SCIENTIFIC PLAYGROUND OF THE FUTURE

WITH MATT MCCORD

Q: What are some of the biggest trends or challenges that clients are asking about these days?

A: Working primarily with Department of Energy (DOE) clients, we see many trends and challenges that are common to many of the clients served by our national practice. One major trend we are seeing at many DOE National Laboratory sites is modular facility design. Some of the challenges include how to attract and retain great employees, competition for project funding, and how to address aging infrastructure and assets.

Q: How does that impact design?

A: One of the big things we're trying to do in relation to funding and occupancy of buildings is design for flexibility. Flexibility can be an overused word, but for the work we've been doing recently, it results in designing agile, adaptable facilities that are scalable to meet the needs of different scopes of research that range from modeling/simulation to bench-scale to demonstration-scale research environments.

Flexibility in many cases can manifest in modular planning principles. This is common in planning for research environments that benefit from repetition driven by lab benches and equipment. Modularity also comes into play with building materials and construction methods. Modular assemblies and off-site prefabrication can often reduce the high costs of construction at remote DOE locations. Additionally, prefabrication in controlled construction environments can lead to a reduction in construction waste, improved safety conditions, and increased quality.

The idea is generalizing space. Whether it's a scientific workplace or office environment, a laboratory or research environment, or other type of research support space, the aim is a model where space isn't necessarily assigned to specific long-term occupants. For instance, a group of researchers might utilize a space to conduct research over the course of a few years. When their research concludes, another group can utilize the space for different research without needing to completely redesign the space.

As a result, we are trying to plan space and design facilities giving consideration for a "greatest common denominator" approach that can be applicable to meet the initial basic needs for different potential users. Less customization up front can expedite execution and maximize facility size within available funding.

This can be a challenge. It can be much easier in an office environment because anybody can pick up their laptop and backpack and work in a different space. It's harder for research environments that may have specific requirements for infrastructure (e.g., power or specialty gases), equipment size and configuration, or hazard classification levels.

Q: What emerging science are you seeing?

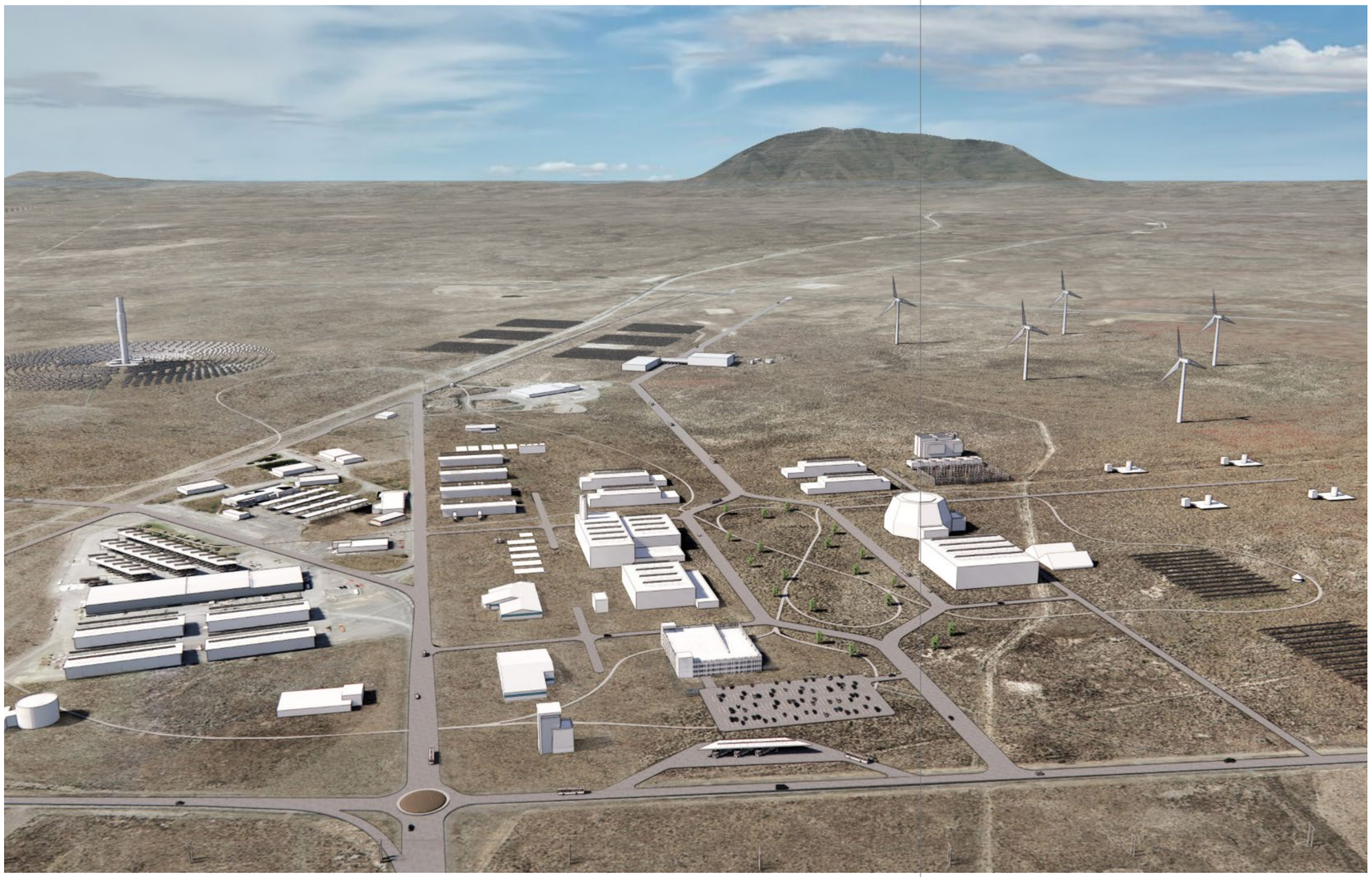
A: Obviously with the DOE and national labs, there is major interest in electrification, carbon-free energy, and resiliency. We're seeing a lot of aspirations to help lead the way and find ways to generate energy in a carbon-free environment. We are seeing this happen through ideation and scientific discovery. We are also seeing this happen through application, demonstration, and relationships with commercial partners.

Our team provides a lot of high-level strategic master planning that sets up a framework for future growth of capabilities and introduction of new research programs. We start with helping our clients create a vision. Then we move into exercises that overlay the many factors and variables to build a development plan. This helps provide a roadmap for long-term planning and development while accounting for aspects that include land use, demolition of aging assets, planning for future utilities and supporting infrastructure, and smart planning of future facility placement.

We are seeing a lot of emerging research around lab-to-pioneer-scale activities that will help provide clean energy options to support net-zero energy operations. A desired outcome of this research is to create integrated energy technology systems that meet federal goals and mandates across all energy sectors. The ability to model, test, and validate these systems and technologies will require large-scale research environments comprised of quickly deployable, flexible laboratory and production facilities that can evolve as research demands dictate.

MATT MCCORD
AIA, NCARB, LEED AP BD+C
ASSOCIATE PRINCIPAL

As a designer and project architect, Matt commits to all phases of project development from master planning and design through construction. He sees design as a method to promote interaction within research environments: to encourage people to come together, challenge each other's thinking, and achieve breakthroughs. True meaning arises from these interactions, which seem spontaneous but often stem from thoughtful planning and design. His approach is grounded in gaining a thorough understanding of his clients' needs, allowing him to meet expectations through critical thinking and creative solutions.



Q: What will a research space look like in 10 or 20 years?

A: Based on what we're seeing now, it seems that there will be what I might describe as different tiers of research environments. Some are heavily funded, large-scale facilities that are fully dedicated to a specific long-term research program or capability. These will be highly customized labs for specific end users.

In the other category are projects that are smaller scale, multi-use facilities supporting general research and providing greater institutional benefits. One of them might be focused on biological research with wet labs. One may be based more on radiological research, so its infrastructure is much different. These multi-use labs will be less customized and able to support a much broader set of end users.

To me the future looks like a combination of these larger and smaller projects that support each other. The larger projects are leading the way, and this collective group of smaller facilities, which when combined, can be equivalent to those larger projects.

I think that's what the future looks like because you can build more of those smaller projects within the framework and the constraints of limited funding, and they can be more adaptable and agile for whatever future research needs may look like. If a new user moves in, they may need to implement specific equipment or elements and customize the space for their needs, but there's a base offering that they get as part of their start-up package.

Q: If you could reimagine the scientific environment of the future, what would it look like?

A: I think the scientific environment of the future looks like a children's playground where people come together, they socialize, and they collaborate. Those interactions lead to discoveries.

This R&D scientific playground will be a collaborative, innovative environment where researchers and scientists have more freedom to experiment, explore new ideas, and develop cutting-edge technologies without the usual constraints of traditional research settings.

It's slightly more free-form. People come and go, and you're not just seeing the same people every day. You're interacting with more people.

That model might work better for some than others, obviously. There will always be concerns with containment, security, or safety that may prevent that from happening everywhere. But I imagine this big park where some kids are on the swings, another group of kids come in from a different neighborhood, they start to interact, and they all decide to play soccer together. All these different things are happening. It's like a little research ecosystem.

Q: How can design support that concept?

A: It's helpful to interject into our designs more of these magnet spaces where that social aspect is heightened and ensure that it's not being removed from the building program. Those social moments can be significant to enable discovery while also creating a respite from the laboratory environment.

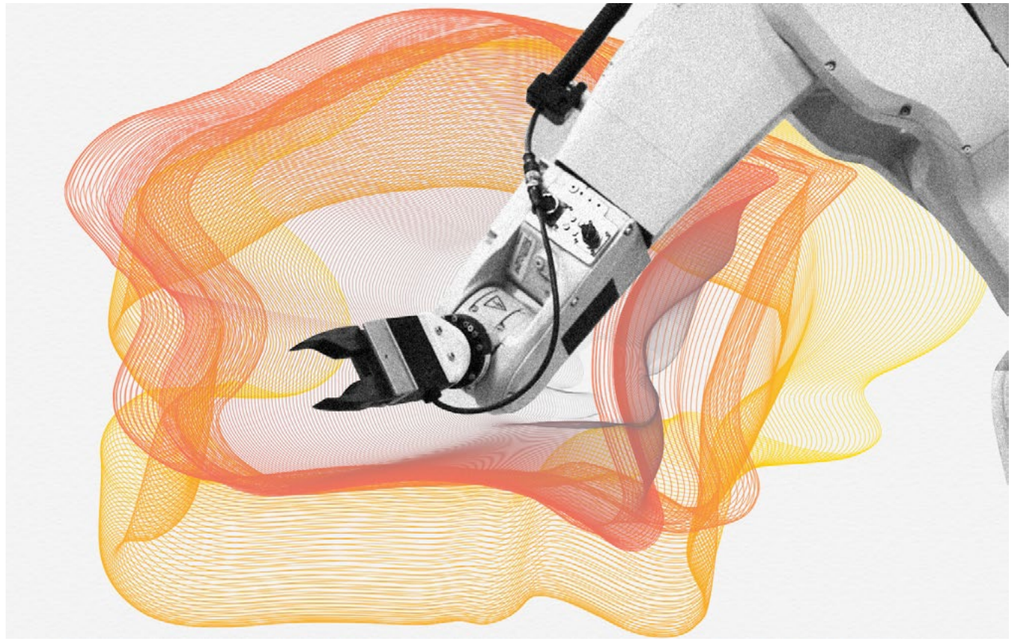
It's important that we design to promote those interactions at different scales. It could be at a campus level within a cluster of buildings, it could be at a facility or building level, and it could be at a smaller laboratory scale environment. Also, people respond and think in different ways, so providing this tapestry of options is how we can use design to enable, promote, and support interactions.

> **"I think the scientific environment of the future looks like a children's playground**

Q: What's an example of a space like this that has been successfully developed?

A: At the Idaho National Laboratory (INL), we designed the Collaborative Computing Center, which houses a high-performance computer and scientific workspace where INL researchers, Idaho universities, and industry partners collaborate to conduct a broad range of scientific research. The facility design is organized around a large, two-story social hub. Fifteen individual and reconfigurable scientific workplace pods are organized around the hub that supports software development and computational research. You can't get into any one of those fifteen spaces without walking through that central social space and interacting with colleagues and peers along the way.

The central space has views that look out to the mountains in the west where you can see the setting sun with the Snake River in the foreground, so the natural environment is right there. It's a place where the design almost forces people to interact with each other without realizing it because people are so focused on the task at hand and might not be seeking out those interactions on their own. It's a space that supports informal meetings and collaboration, a place for a quiet moment, a change of scenery. It's also a campus amenity space that occupants of adjacent facilities often seek to take advantage of its amazing qualities.



TECHNOLOGY IMPACTING LABS: AI, ROBOTICS, BALANCING DATA SPACE AND WET LABS

WITH PHILIP RA

Q: How will advancing technology impact research spaces in the future?

A: In general, scientists have a clear objective of what they want to achieve with their research. I don't think that will change much. But what is changing is the arsenal of different types of tools that they need, and I think there's more of a collaborative need. Similar to how the whole world experienced COVID with this collective energy that we all had to figure out solutions together, we're going to be addressing AI in the same way, trying to figure out how to work most effectively with AI.

In a recent programming meeting, we had wet lab and computational researchers. They had the opportunity to divide their spaces in their own fiefdom, but they purposely said, "I want to see what others are doing," which is not very common. A lot of these people usually want their own space. But they were willing to share, thinking "I can go into my office and do my work, but I also want to see what others are doing," so I think this is a collective direction where we may be headed that normally you don't see.

Q: How do you see more hybrid office situations impacting the lab if people aren't necessarily tied to the bench all day or can do some research remotely?

A: I think robotics come into play. In wet labs where people are doing very challenging experiments, I wouldn't be surprised if in the future they would have a full-time robot that does most of the work and is controlled remotely.

Automating that process will be the new frontier. I imagine with AI, we may see more researchers computing many scenarios and then using robots to simulate these scenarios in real life. Then the researchers may come to the lab to work in parallel with the automated processes and validate their work.

Q: What is the biggest lab planning and programming challenge you've encountered with a client recently?

A: In recent work-group sessions with biological sciences and health sciences, researchers are constantly requesting more physical space, but also data space. They're running out of data space, and they want their own servers because it costs more to get a private server somewhere else.

Universities will need to address questions such as, should they have a data server that the whole university can share? How do they provide power? How do they provide backup and security? How do they provide cooling for all these servers?

We're seeing a transition with wet labs being repurposed to server space because the mechanical and electrical loads are similar to the requirements for a data server. With the advent of AI, there's larger demand for data server space on campus and outsourced from third parties.

Q: What's one of the most innovative things you've seen recently on a project?

A: We know lab buildings use a lot of energy. For one of our projects the city required that we used electrical for heating and cooling, and we also had to put photovoltaic panels in the building wherever we had space for them.

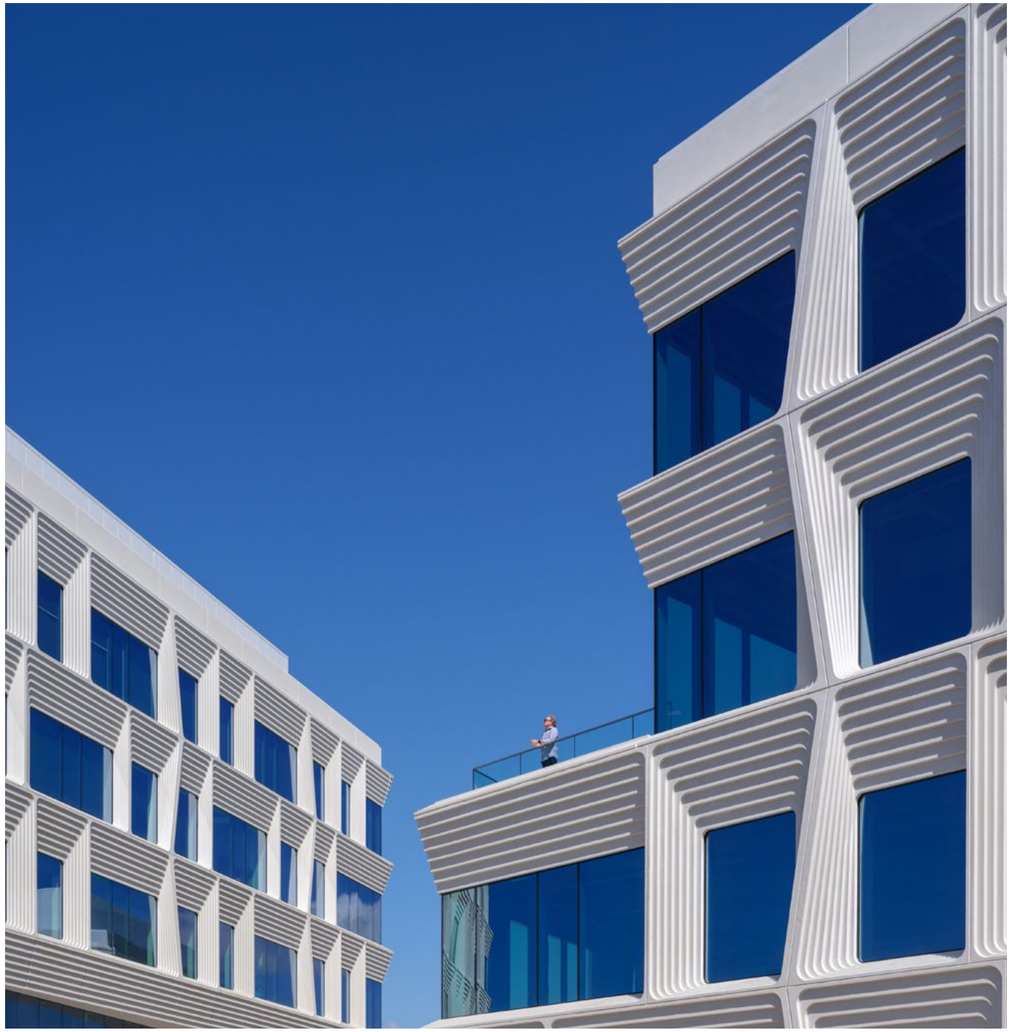
Now that building has achieved one of the best energy efficiency ratings in our entire portfolio. I think that speaks volumes about what we need to do in terms of changing how we design. I think we need to encourage more of that because with the climate crisis we're dealing with around the world, we need to figure out how to get a steady supply of energy into our buildings and make it work.

If we're going into more data science, AI, and computation-related direction, and then eventually with robotics as part of the equation, there will be a distinction between human spaces, non-human spaces, and co-habitated spaces with human-robot collaboration.

Human spaces require natural daylight and a connection to nature as much as possible versus data spaces or machine spaces, where it doesn't matter. They just need power and cooling and heating to maintain a workable temperature, but maintaining power will be critical. So, I see the requirements for battery, electric generation, and other environmentally friendly solutions to this.

PHILIP RA
AIA, LEED AP BD+C
PRINCIPAL, DESIGN DIRECTOR

Philip's passion for both architecture and technology has led him to be an innovator in the use of digital technology during building design. With more than 30 years of experience, he brings a strong background and a working knowledge in architecture, as well as an abiding interest in the ways that algorithmic and semi-autonomous computation can validate and strengthen architects' design concepts. Integrating these digital instruments during the design process refines the design to develop optimal building conditions, enhancing the goals and objectives of the project.



> **There will be a distinction between human spaces, non-human spaces, and co-habitated spaces with human-robot collaboration.**

Q: Focusing on human spaces, there has been an increased emphasis on natural light, science on display, and connections to people and nature. Will that continue?

A: Yes, I think we'll continue to see more of this. It's about people. There needs to be incentive for people to come into these workspaces. The workplace needs to offer something that you can't get at home, which is the collaboration with your colleagues or whomever you're working with and being close to the research or experiments that you're doing.

In the programming meetings that I've been in, the researchers don't want to be far away from their research. They want to be close, and that suggests to me that the idea of science on display is not as much for the public as it is for people who are working there or doing their research, who are able to be in a human space but can look over to see what's going on in person. I'm sure it can be done with cameras, but it's not the same.

Q: How will artificial intelligence impact labs?

A: AI will not replace labs, but it will amplify and enhance how we do our work. The thing that we're going to be struggling with is validation and security of AI.

I don't know what kind of a world we're going to be living in within the next 10-20 years, but it's definitely going to be interesting.

We had the industrial revolution, which changed things overnight, then we had the computer revolution, and then more recently the internet revolution. I think AI is exponentially more complex, and it really challenges how we work. I think we are better prepared for it now than if it were 10-20 years ago. No one can ever be fully prepared for such a disruptive force, but now that it's here, we need to learn how to embrace and work with it.

IDEAS & INSIGHTS

DESIGNING TO SUPPORT WELL-BEING AND SUSTAINABILITY

BY JANIE ANGELERI

The rise of hybrid work has given many people the opportunity to personalize a home office to meet their specific needs and level of comfort, which in some cases has highlighted the benefits of a hospitable and comfortable workplace to productivity and employee mental and physical well-being.

Coupled with an urgency for sustainable practices, which strongly correlate with overall well-being, employers now face greater responsibility and higher expectations to provide a comfortable work environment. These stakes are especially high for scientific workplaces, where fully remote work is not often feasible, and there is fierce competition to attract and retain highly skilled employees whose research tasks require focus and precision.

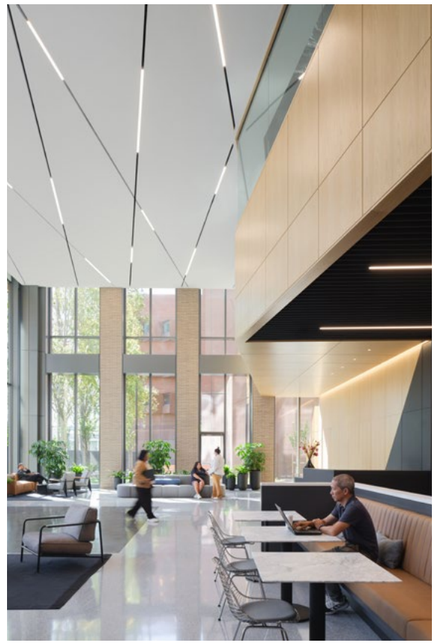
What Defines Comfort in a Scientific Workplace?

More than simply a desk or a lab bench with proper lighting and equipment, a comfortable work environment should be designed to holistically support employees' well-being. This includes physical, mental, and social needs, and each of these areas intersect with one another.

Whether a new build, renovation, or fit-out, it is crucial for the project teams, including client leadership and key stakeholders, to establish project goals for sustainability and well-being from the onset. Knowing these intentions will help to weave the necessary steps to achieve these goals into every step of the project and ensure they are part of the budget.

Returning to the idea of working from home, for many people, the benefits extended beyond wearing sweatpants to a meeting or avoiding the morning commute. It's opened our eyes to the positive mental results that come from being able to control physical aspects such as noise level, temperature, and lighting, not to mention easier access to a needed snack or hot meal. All of these factors can result in a better mental state and more productivity.

The same concepts can and should be brought to the in-person office and laboratory. They are also the basis for workplace wellness certifications such as WELL and Fitwel, which provide the opportunity to quantify and improve these factors that contribute to well-being. This includes the most basic human needs such as access to clean air and water, availability of nutritious food, and support of physical movement, as well as broader concepts such as community health, among others.



Wellness and Sustainability

These concepts are also congruent with LEED and other sustainability certifications when it comes to things like biophilic design, avoiding the use of hazardous materials, and clean energy. Humans have a fundamental relationship with the natural environment, and what is good for the planet is usually good for your health.

One crucial component in the design of any workplace is light, with considerations such as daylighting and avoiding glare. Because of the need for specialized equipment and greater air and water filtration needs, the scientific workplace usually has higher energy requirements than other workplaces. Allowing natural lighting in a research laboratory won't offset this higher energy consumption, but it can have a considerable positive impact on well-being.

Lighting sensors can adjust to lower overhead lighting when there is plenty of natural light in a space or help to ensure lights don't remain on in an unoccupied space or an entire room when only a small area is occupied.

Another area where sustainability and health concerns overlap considerably is specifying materials. Ensuring building materials and finishes are completely free of hazardous chemicals can be a challenge because it's difficult to confidently know all potential long-term health impacts with 100 percent certainty when new materials are constantly being developed.

Similarly, tracking all aspects of the supply chain from labor practices to the environmental impact of manufacturing of materials is not always easy to determine. To address this, Flad has developed an extensive library of vetted materials, by continually working with our manufacturing partners, reviewing their available transparency documentation, and selecting proven materials based on their health and environmental impacts. We discuss these healthier materials and their benefits with our clients, working together to improve the health of the work environment.

On-site Amenities

Beyond natural lighting, materials, and the other components that contribute to comfortable physical workspace, more organizations are providing an expanding range of on-site amenities such as free gourmet coffee, a wider variety of food options and food locations, wellness rooms, fitness facilities, and even on-site services like nurses/physicians assistants and hairstylists. These conveniences can reduce the stress of scheduling appointments outside of work hours, making life a little easier and allowing employees to focus on the task at hand.

While sometimes viewed as “soft benefits” whose ROI can’t be tangibly measured, they are nonetheless important. When people have a choice to come into the office or not, the workplace needs to provide a value that employees wouldn’t get working from home. We have seen it with welcoming lobbies that provide grab-and-go food options, cafés, and informal gathering spaces, comparable with the lobby of an upscale hotel. In the case of large, life science campuses, it’s becoming more common to have an on-site amenity building with these options as well as fitness facilities, yoga studios, gardens, outdoor patios, and more.

Many of these ideas are becoming more popular, if not yet common in all cities across the country. As the competition to attract and retain talent remains high, the trend of providing services that help support well-being can be expected to grow.

Conclusion

In recent years, we have also started to see organizations' human resources groups involved in the programming of scientific workplaces. The HR department has a unique position, both working in the best interests of organizational leadership and working to ensure an accommodating environment for employees. In many ways this can be helpful as HR has a good understanding of the specific occupants of a space and their needs and can be valuable resources for change management.

This is also a sign that organizations are recognizing the importance of providing not just a space to complete a task or meet with coworkers, but a workplace that is designed with consideration for overall mental and physical well-being of its occupants. As a hybrid workplace model is likely here to stay, I expect we will continue to see more improvements and thoughtful design to provide a more holistic comfortable work environment.

Flad’s Ben de Rubertis, Russ Drinker, Kim Reddin, Staci Romano, Gabrielle Saponara, and Kim Swanson also contributed their insights for this story.

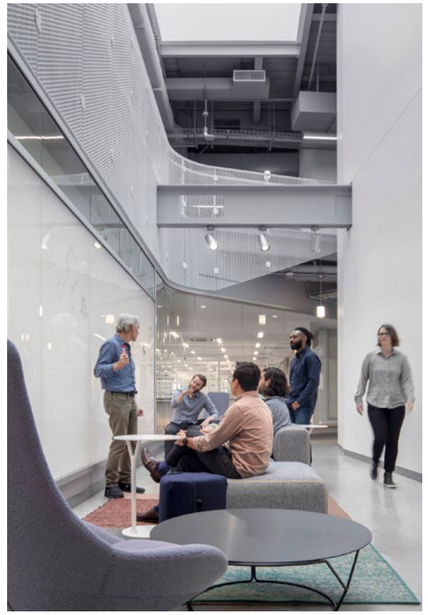
CREATING A SENSE OF BELONGING WITH THOUGHTFUL DESIGN

BY JANIE ANGELERI

A workplace exists to support people driving toward a common goal; however, when designing a space to support those goals, it is important to acknowledge that people may prefer to take different routes. Just as a person's home reflects their personal tastes and preferences, a workplace environment should be designed to support individual personalities and preferences.

In a previous story, we explored the idea of comfort in a scientific workplace and designing for physical well-being with considerations such as lighting, air quality, sustainable materials, and nutrition. A holistic view of comfort and well-being extends beyond physical elements and includes mental and social aspects including relationships, perceived status within a team or organization, and creating a sense of belonging.

With this in mind, it is worth noting that people experience and interact with the world around them in many ways. There is not a correct way of thinking, learning, and behaving. Most importantly, these differences are not weaknesses and can often be strengths.



More broadly, individuals have different personalities, preferences, and work styles, and design should reflect that. In fact, many of the high-performing, creative, and innovative individuals that are crucial for organizations whose mission is to advance scientific research may find working within the bounds of standard workplace environments difficult.

With that in mind, how can design support these differences and preferences? One obvious solution is to give people options beyond the standard rows of cubicles or open-office desks.

We've worked with a number of corporate life science organizations that have embraced this concept by providing a variety of work zones within a single building or campus, allowing employees to choose the space that meets their needs. In addition to flexible lab space, these zones include open collaborative spaces, library spaces where multiple people can work quietly, huddle rooms for small meetings or video calls, cafés for casual interactions, and even meditation rooms.

In addition to offering choices in work environment, organizations need to consider the impacts of design decisions on sensory experience within the workplace. The right combination of color, sound, lighting, temperature, and even smells can effectively create spaces that support neurodiverse needs. Without feeling too bland or too distracting, a well-curated space should provide a moderate amount of visual complexity to provide a level of comfort that allows people to focus while inspiring creativity and innovation.

Some of our clients have adopted the notion of unassigned seats, so employees can select the best environment for the day or for a specific task. This is a recognition that mindsets and space needs vary not only from person to person, but also throughout the day for the same person.

Empowering employees to adjust their space or location with options like sit/stand desks and the ability to seek a private space or collaborative space provides a comfortable level of control. Similar to the idea of flexible labs that can be easily reconfigured to adapt for new equipment or research initiatives, companies can offer employees office spaces that can be customized to their needs and preferences. While allowing for individual choices, some guidelines, such as ensuring each team has a home base within the building, will maintain a level of consistency.

Allowing people to select locations within their team's designated area also increases the opportunity to interact with more colleagues, which builds trust and relationships throughout the team and inspires new ideas and new collaborations.

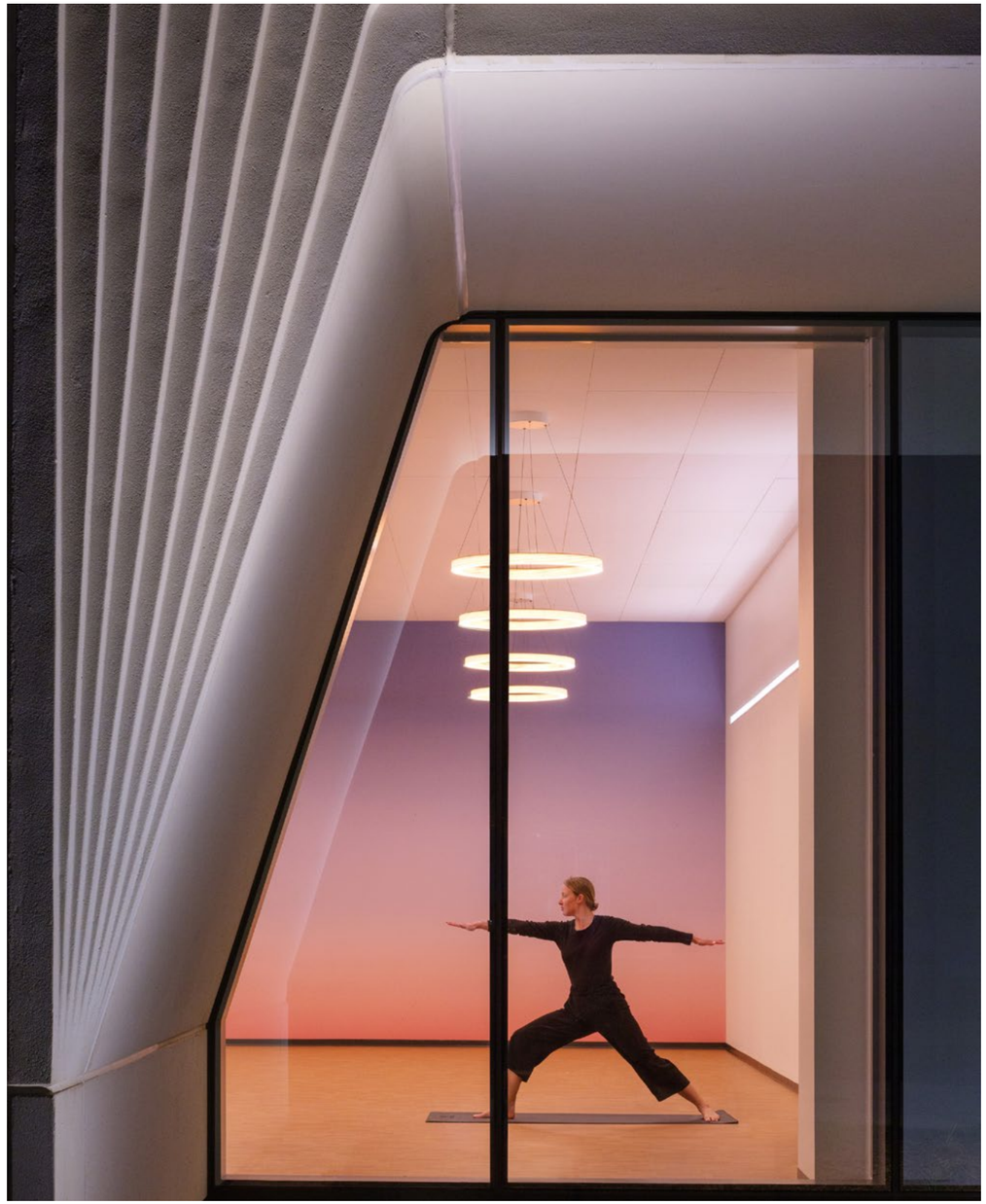
The implementation and effectiveness of these ideas depends on company culture and other factors. For example, unassigned seats are an important aspect of the workplace culture for some of our clients, while others have experimented with unassigned seats and then returned to assigned seats for various reasons.

It is also worth noting that while organizations may see the benefit of collaboration spaces, they are often the first thing to be eliminated when difficult programming decisions need to be made, as that real estate can be more valued for additional lab space or equipment. Therefore, collaboration spaces often need a strong advocate within the organization in order to be implemented.

All of these concepts predate the pandemic and the resulting rise in hybrid work, though they have increased in popularity as people have become more aware of and less able to tolerate distractions and uncomfortable workspaces. Even minor things that have always been part of the work environment, such as hearing other people's conversations or phone calls, may now be more noticeable after experiencing alternative options working from home.

When it comes to avoiding distractions and providing a comfortable space that supports everyone, the paradox of beautiful design is that it is often invisible. By providing a workspace for scientists to work without mental or physical distractions, they may not notice that there aren't any distractions. In the end, that may be the goal: a workplace environment that seamlessly accommodates everyone. Non-verbal cues, such as a thoughtfully designed workplace, show that an organization cares about its employees, which ultimately results in improved well-being and better performance.

Flad's Ben de Rubertis, Russ Drinker, Kim Reddin, Staci Romano, Gabrielle Saponara, and Kim Swanson also contributed their insights for this story.



BUILDING DESIGN + CONSTRUCTION

BSL CONVERSIONS: A COST-EFFICIENT METHOD TO SUPPORT HIGH-CONTAINMENT RESEARCH

BY MIKE MORELAND AND ROSS FERRIES

When the COVID-19 pandemic arrived in the United States in 2020, the American research community experienced a sudden spike in funding. Universities, pharmaceutical companies, and state and federal agencies all showed a renewed interest in studying emerging infectious diseases, and the National Institutes of Health (NIH) increased its research budget request by the most significant amount in nearly 20 years.

This raised level of national concern for preparedness sparked many institutions to quickly increase their BSL-3 capacity to study COVID and other emerging infectious diseases that could potentially threaten society. Organizations with existing high-containment biological research spaces were well positioned to support ongoing and future studies, while many organizations that had decommissioned previous BSL-3 spaces were faced with rapid response challenges.

Although increased attention to biomedical research offered opportunities for universities and other research institutions, those opportunities came with costs and risks. Creating new biocontainment facilities is an expensive endeavor, and as government and private funding levels fluctuate based on urgency, universities and other research institutions that build new dedicated high-containment facilities may now find themselves with costly labs in a stagnant funding environment in the future.

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LAB DESIGN NEWS

UNIVERSITY OF KENTUCKY'S CAFE EXPANDS WITH MODERN AGRICULTURAL RESEARCH HUB

CO-AUTHOR CHAD ZUBERBUHLER

The University of Kentucky (UK) recently broke ground on a state-of-the-art agricultural research building for the Martin-Gatton College of Agriculture, Food and Environment (M-G CAFE). This 269,000-square-foot facility will consolidate multiple departments and research functions currently spread across several older buildings and provide space for new research and increased capabilities.

Featuring advanced laboratories, rooftop greenhouses, teaching labs, and a versatile auditorium, the building is designed to foster collaborative and interdisciplinary research. This aligns with the university's commitment to innovation in agricultural sciences and sustainable practices. "The research planned for the Agricultural Research Building will host cutting-edge research," says James Matthews, M-G CAFE associate director for research. "Critically, this building will serve as a hub where our researchers can easily collaborate across disciplines, engage with agricultural industries, and work closely with the state's producers with the goal of improving the quality of life for Kentuckians and boosting the Commonwealth's economy."

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LAB DESIGN NEWS

WHAT WE REALLY NEED: A CONVERSATION WITH LAB OPERATORS

BY PASQUALINO PANNONE

I recently had the privilege of leading an industry focus group at the LabOps Unite Leadership Conference in Cambridge, MA. The LabOps community is a global network of lab operators and professionals sharing their knowledge and experience with their colleagues. The group is a resource for everything from recommendations on donating surplus supplies and equipment to navigating a city's biotech checklist for an inspection.

These are the people who keep the labs running behind the scenes (with responsibilities like responding to alarms in the middle of the night) so that the scientists can focus on their mission-critical work. With that in mind, this was the perfect group to ask a few questions about what works and doesn't work in a lab, what users are requesting, and what insights they have about future lab trends.

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THE ARCHITECT'S NEWSPAPER

FLAD ARCHITECTS REFERENCES GEOLOGICAL FORMATIONS FOR NEW LIFE SCIENCE RESEARCH BUILDING IN SAN DIEGO

FEATURING PHILIP RA

At Torrey Heights, a life science research campus in San Diego by Flad Architects and Breakthrough Properties, the idea was to harmonize building with environment. The campus buildings reflect geologic formations; this was achieved by replicating the layered geology of canyons using precast concrete and Glass-Fiber Reinforced Concrete (GFRC).

The project spans 10 acres to encompass a 515,000-square-foot life science research campus, blending functionality with aesthetic appeal. The campus consists of three multistory research buildings and a standout amenity building with a cantilevered roof. Additionally, there is a 1,400-stall parking structure that lies partially below grade beneath the amenity building. Among the tenants is BD Biosciences, one of the largest medical technology companies in the world.

Flad Architects's design was informed by the site's geology. The GFRC panels blend seamlessly with the environment in both color and texture. The dynamic interaction offers unique visual effects on all four facades. "We were inspired by the landscape and layered geology of the canyon space and the Arroyo area, incorporating elements of old Roman and Renaissance architecture and perspectival stepping," Philip Ra, design director and principal at Flad Architects, told AN.

READ FULL ARTICLE >

BUILDING DESIGN + CONSTRUCTION

SCIENCE IN THE SKY: DESIGNING HIGH-RISE RESEARCH LABS

BY JOSEPH MARSHALL

While the birth of the high-rise building can be traced back to the late nineteenth century, designing high-rise buildings for the purpose of science remains a relatively recent concept. Historically operating outside of the urban context, traditional laboratory facilities have often been characterized by industrial and warehouse districts far removed from the public realm.

But unprecedented technological acceleration towards the end of the twentieth century—coupled with explosive growth in the biotechnology and pharmaceutical industries—sparked an evolution where research corporations began seeking more interconnected, urban locations to house their workforces and scientific operations. The high-rise science building of today represents this industry-wide shift as these facilities increasingly break away from their once-siloed counterparts—responding to a variety of socioeconomic and environmental demands—and fully integrate within the existing cultural fabric of the modern metropolitan landscape.

READ FULL ARTICLE >

FLEXIBLE LABS ANIMATION

Laboratory technology is rapidly changing with advances in robotics, AI, and data analytics. As a result, it's more difficult than ever to predict your laboratory space and equipment needs five or ten years into the future. Designing labs that are highly flexible can help mitigate the risk of additional costs and operational disruption as your research needs evolve. Watch this video to see the variety of equipment and containment options a flexible lab can easily accommodate.

WATCH ANIMATION >

Flad Architects is a national knowledge-based planning and design firm committed to creating environments that enhance human potential. In partnership with science-based companies, leading research organizations, universities, and, healthcare institutions Flad designs innovative facilities with standout dedication to detail. These advanced spaces enable the clients Flad serves to make revolutionary discoveries that have a profound impact on society.

Over 95 years of passionate and rigorous focus on buildings devoted to the sciences has earned Flad consistently high rankings among the nation's top architectural firms, both overall and in science and technology, academic, and healthcare design. With more than 300 design awards, Flad's work amplifies the abilities of those learning, working, and undergoing treatment in those environments.

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