奥比德·图尔苏诺夫：用科技治愈地球

Obid Tursunov: Healing the Earth with Science and Technology

文/郭思桥 (by Guo Siqiao)

在乌兹别克斯坦莫伊纳克地区的荒漠上，一束低功率激光悄然唤醒沉睡的黑沙蒿种子，数周后，死寂的土地冒出点点绿芽；在中国农业大学的实验室里，棉花秸秆、玉米芯这些农业废弃物“变身”为生物煤与富氢合成气。这两个跨越万里的场景，被一位科学家紧密相连，他就是奥比德·图尔苏诺夫教授。从环境保护专业起步，到深耕激光生物技术与生物质能源交叉领域，他用近二十年的科研生涯，将“科技治愈地球”的理想，从实验数据一步步变为现实。近日，我们对话奥比德·图尔苏诺夫教授，探寻他如何用科技“治愈”地球的故事。

“循环经济的有意识参与者”

“我在乌兹别克斯坦长大，干旱和土壤退化这类概念并非抽象的课本知识，而是日常生活的背景。”在乌兹别克斯坦的家乡，他目睹了农田盐碱化缓缓蔓延，亲身感受水资源短缺时社区的焦灼与无奈。本科就读于塔什干汽车道路建设学院环境保护专业的他，虽掌握了干旱、资源枯竭、不可持续做法等描述环境问题的专业术语，却愈发清晰地意识到“诊断问题并非解决之

In the desert of the Moynaq region in Uzbekistan, a beam of low-power laser quietly awakens the dormant black saxaul (Haloxylon aphyllum) seeds. Weeks later, tiny green shoots emerge from the lifeless land. In the laboratory of China Agricultural University, agricultural wastes such as cotton stalks and corn cobs are transformed into bio-coal and hydrogen-rich syngas. These two scenes, separated by thousands of miles, are closely connected by one scientist—Prof. Obid Tursunov. Starting from the Environmental Protection major, he has dedicated himself to the interdisciplinary field of laser biotechnology and biomass energy. Over nearly 20 years of his scientific research career, he has gradually turned his vision of "healing the Earth with science and technology" from experimental data into reality. Recently, we conducted an interview with Professor Obid Tursunov to explore the story of how he "heals" the Earth through science and technology.

"A Conscious Participant in Circular Economy"

"I grew up in Uzbekistan, where concepts like drought and soil degradation are not abstract textbook knowledge—they're the backdrop of daily life." In his hometown in Uzbekistan, he witnessed the slow spread of farmland salinization, and personally felt the anxiety and helplessness of the community amid water scarcity. As an undergraduate majoring in Environmental Protection at the Tashkent Automobile and Road Construction Institute in Uzbekistan, he mastered professional terms describing environmental issues (such as

奥比德·图尔苏诺夫（音译），乌兹别克斯坦籍，乌兹别克斯坦塔什干灌溉与农业机械工程国立研究大学教授，中国农业大学“人才青年科学家计划”特邀高端学者

Obid Tursunov, a national of Uzbekistan, is a Professor in the Department of Power Supply and Renewable Energy Sources at TIIAME National Research University, Uzbekistan, and an Invited "High-end" Scholar of the TYSP (Talented Young Scientist Program) at China Agricultural University.

奥比德·图尔苏诺夫（右）出席中国农业大学生物质能科学与技术国际联合研究中心（iBEST）2025大循环国际研讨会

Obid Tursunov (right) at the "Great Cycle Symposium" held by the National Center for International Research of BioEnergy Science and Technology (iBEST) of China Agricultural University, Beijing, China.

道”。

“对我而言，仅仅保护生态环境免受进一步破坏已远远不够；我迫切需要运用前沿的交叉学科工具来恢复和改善生态环境”。这份迫切的改变之心，推动着他“从记录环境退化转向主动设计修复方案。”他回忆，在持续关注环境问题的过程中，两个看似不相关的领域进入了他的视野：一方面，农业废弃物露天焚烧加剧空气污染，而通过技术手段可将其转化为清洁能源和生物肥料，这对农业社会而言是理想的循环经济模式；另一方面，低功率激光在刺激种子萌发、增强微生物活性、提高植物抗逆性等方面的研究进展，让他看到了精准修复生态的可能。

drought, resource depletion, and unsustainable practices)—yet he became increasingly clear that "diagnosing problems is not the way to solve them."

"For me, merely protecting the ecological environment from further damage is far from enough; I urgently need to use cutting-edge interdisciplinary tools to restore and improve the ecological environment." This urgent desire for change drove him to "shift from documenting environmental degradation to proactively designing restoration plans." He recalled that while focusing on environmental issues, two seemingly unrelated fields came into his view: On one hand, open-air burning of agricultural waste worsens air pollution, but technical means can convert it into clean energy and bio-fertilizers—an ideal circular economy model for agricultural societies; on the other hand, research progress in low-power lasers (for stimulating seed germination, enhancing microbial activity, and improving plant stress resistance) made him see

2016年，奥比德·图尔苏诺夫考取波兰的克拉科夫AGH科技大学博士学位，主攻环境生物技术与生物能源学。自此，他“以生物工程师的身份，去解决最初作为环保研究者时发现的问题”。这一选择，是他对祖国实际挑战的直接回应，博士论文《激光生物技术生产生物质与清洁热技术结合》，更是为他后来的研究定下核心：掌握可持续能源与资源回收的完整价值链。

“终身研究者”的跨国科研

谈及奥比德·图尔苏诺夫教授的科研履历，我发现他的科研项目涉及马来西亚、俄罗斯、波兰、中国等多个国家。在马来西亚玻璃市大学，他专注稻壳热解制生物燃料项目，掌握了碳循环“前端”的生物质收集与热化学转化技术；在国家研究型工艺大学“莫斯科钢铁合金学院”杜尚别分校，他深耕二氧化碳催化转化研究，攻克碳循环“后端”的气态碳废弃物处理难题；在波兰，他则将前两项研究成果系统整合，开展技术经济分析与环境影响模拟。这些看似跨度极大的研究主题，实则构建碳循环价值链的战略步骤。正如他所说：“我不认为这些过渡是脱节的变化，而将其视为一个更大故事的不同章节。”

跨越国界的研究并非坦途，知识壁垒与技术差异是必须攻克的难关。从热解研究转向二氧化碳催化转化时，他需要快速掌握催化剂合成与表征、精准反应机理等全新知识；进入新的实验室，不仅要熟悉高压催化反应器等陌生设备的操作，还要适应每个团队独特的“实验室语言”和“这里的做事方式”。

面对这些挑战，奥比德·图尔苏诺夫教授始终保持“终身研究者”的心态，走

the potential for precise ecological restoration.

In 2016, Obid Tursunov earned his doctoral degree from AGH University of Science and Technology in Kraków, Poland, specializing in environmental biotechnology and bioenergetics. Since then, he has "solved the problems he first identified as an environmental researcher, now acting as a biotechnological engineer." This choice was a direct response to the practical challenges facing his home country. His doctoral dissertation, Combination of Laser Biotechnology with Biomass Production and Clean Thermal Technology, further defined the core of his subsequent research: mastering the complete value chain of sustainable energy and resource recycling.

Cross-Country Scientific Research of a "Lifelong Researcher"

When looking at Prof. Obid Tursunov's research resume, I find that his research projects span multiple countries including Malaysia, Russia, Poland, and China. At Universiti Malaysia Perlis (UniMAP) in Malaysia, he focused on the rice husk and municipal solid waste pyrolysis for biofuel project, mastering the biomass collection and thermochemical conversion technology at the "front end" of the carbon cycle. At National University of Science and Technology MISIS (NUST MISIS) in Russia, he dedicated himself to research on CO_2 catalytic conversion, overcoming the challenge of gaseous carbon waste treatment at the "back end" of the carbon cycle. In Poland, he systematically integrated the results of the previous two research projects and conducted techno-economic analysis and environmental impact simulation. These research topics, which seem to have a wide scope, are actually strategic steps to build a carbon cycle value chain. As he put it: "I do not see these transitions as disjointed changes, but rather as different chapters of a larger story."

Cross-border research is by no means a smooth journey, and knowledge barriers and technical differences are hurdles that must be overcome. When shifting from pyrolysis research to CO_2 catalytic conversion, he needed to quickly master brand-new knowledge such as catalyst synthesis and characterization, and precise reaction mechanisms. When joining a new laboratory, he not only had to familiarize himself with the operation of unfamiliar equipment like high-pressure catalytic reactor systems, but also adapt to the

奥比德·图尔苏诺夫正在咸海干涸区域检查黑沙枣的发芽情况

Obid Tursunov checking the germination condition of Black Saxaul at the dry area of Aral Sea.

一条通过主动学习与战略人脉搭建相结合的科研道路：赴任前，他会花费数月时间深入研读基础文献，提前构建概念框架；研究中，他专注于打磨反应器操作、数据分析、材料表征等可迁移技能，快速建立专业可信度；遇到疑问时，他从不畏惧请教“基础问题”，也会额外投入时间重复实验、校准流程，逐步积累技术熟练度。正是这种主动探索与持续学习，让他在不同研究领域间自如切换，为后续的跨国合作奠定了坚实基础。

如今，同时在乌兹别克斯坦塔什干灌溉与农业机械工程国立研究大学、中国农业大学和石河子大学的他，早已深谙跨国家协作的精髓。通过定期举行联合线上实验室会议，让两国博士生汇报进展、交流思想，既确保了研究方向的一致性，又实现了不同农业系统和学术传统的优势互补。“正是这种模式产生的强大协同效应，让我觉得极富成

unique "Lab Language" and "how things are done here" of each research team.

Facing these challenges, Prof. Obid Tursunov has always maintained the mindset of a "lifelong researcher" and followed a research path that combines proactive learning and strategic networking. Before taking up a new role, he would spend months deeply studying foundational literature to build a conceptual framework in advance; during research, he focused on honing transferable skills such as reactor operation, data analysis, and material characterization to quickly establish professional credibility; when encountering questions, he was never afraid to ask "basic questions" and would also invest extra time repeating experiments and calibrating processes to gradually accumulate technical proficiency. It is this proactive exploration and continuous learning that have allowed him to switch freely between different research fields, laying a solid foundation for subsequent cross-country cooperation.

Today, holding positions at Tashkent Institute of Irrigation and Agricultural Mechanization Engineers National Research University (TIIAME National Research University), China Agricultural University (CAU) and Shihezi University (SHZU) in China he has long been well-versed in the essence of cross-country collaboration. By holding regular joint virtual lab meetings where PhD students from both countries report on progress and exchange ideas, he not only ensures the consistency of research directions but also realizes the complementary advantages of different agricultural systems and academic traditions. "It is the powerful synergies generated by this model that make me find it extremely productive," he said. The resource complementarity and idea collision between different countries can often lead to a qualitative leap in problem-solving efficiency.

A Gentle Yet Powerful Tool to Heal Our Planet

"I Believe the Highest Value of Technology Lies in Its Power as a Catalyst to Empower People and Local Communities to Solve Their Own Challenges"

This philosophy runs through all of Prof. Obid Tursunov's scientific research practices. The black saxaul (Haloxylon aphyllum) planting project carried out in the Moynaq region of Uzbekistan is a typical example of his in-depth integration

效。”他说道，不同国家的资源互补与思想碰撞，往往能让问题解决效率实现质的飞跃。

温和而强大的治愈地球工具

“我相信技术的最高价值在于其作为催化剂的力量，赋能人们和地方解决自身面临的挑战。”这一理念，贯穿于奥比德·图尔苏诺夫教授所有的科研实践中。在乌兹别克斯坦莫伊纳克地区开展的黑沙蒿种植项目，便是他将激光生物技术与群众需求深度融合的典范。

莫伊纳克地区因咸海萎缩，面临着严重的土壤盐渍化和生态退化，当地居民对各类“解决方案”保持着警惕。“他们见

of laser biotechnology with the needs of local communities.

Due to the shrinking of the Aral Sea, the Moynaq region faces severe soil salinization and ecological degradation, and local residents remain vigilant toward various "solutions". "They have witnessed many well-intentioned projects come and go with limited success," Prof. Obid Tursunov is well aware that building trust is a prerequisite for technology implementation. Relying on the long-standing institutional credibility of Tashkent Institute of Irrigation and Agricultural Mechanization Engineers National Research University (TIIAME National Research University) accumulated in the region, the team started with science popularization of the technology. They explained "laser" in a simplified way as a "light stimulant" or "seed energizer", and used the analogy of "controlled sunlight exposure" to dispel residents' associations of lasers with science fiction. At the same time, the team directly addressed residents' practical concerns

奥比德·图尔苏诺夫参观中国新疆的石河子大学的棉花试验田
Obid Tursunov visited experimental cotton field of Shihezi University in Xinjiang, China.

证过许多善意的项目来来去去，却收效甚微。”奥比德·图尔苏诺夫教授深知，技术落地的前提是建立信任。依托塔什干农业工程与灌溉大学长期在该地区积累的机构公信力，团队从技术科普入手，将“激光”简化解释为“光刺激剂”“种子能量增强剂”，用“可控阳光照射”的类比消除居民的科幻联想，同时直面他们对电力需求、成本、植物特性变化等实际关切，逐步将怀疑转化为“愿意尝试看看”的态度。在项目设计中，当地居民参与被视为核心支柱。地块选择不仅参考卫星数据，更组织当地牧民和长者实地考察，利用他们对土地的深刻认知，识别出“仍有植物试图生长”的微区域；日常照料则采用协作模式，团队培训居民进行幼苗监测、风沙防护，并建立社区主导的节水灌溉方案，让居民从被动观察者转变为主动合作研究者。

经过两个生长季，项目取得了令人鼓舞的初步成果：激光处理种子的发芽率比对照组提高约60%，幼苗根系发育更快，示范地块的植被覆盖率显著提升，表土稳定性增强，沙尘移动减少。更重要的是，间苗后的黑沙蒿嫩枝成为当地小型牲畜的补充饲料，为居民带来了实际收益。“看到荒芜土地焕发生机，这种恢复的能动性和希望感，是可持续发展的重要资源。”奥比德·图尔苏诺夫教授感慨道。用一句话概括激光生物技术的价值，他这样说：“激光生物技术利用光的精准性激发植物的内在潜力，让我们能够用更少的水和化学品培育更茁壮的作物、恢复退化的土地，为治愈地球提供一种温和而强大的工具。”

奥比德·图尔苏诺夫教授也向我简要介绍了他中乌合作的“农业废弃物热转化制生物煤和富氢合成气”项目。针对乌兹别克斯坦棉花秸秆灰分含量高、结构坚固的特

about electricity requirements, costs, and changes in plant characteristics, gradually turning their skepticism into a willingness to "give it a try". In the project design, local residents' participation was regarded as a fundamental pillar. For plot selection, the team not only referred to satellite data but also organized local shepherds and elders to conduct on-site surveys. Leveraging their in-depth knowledge of the land, the team identified micro-areas where "plants still try to grow". For daily care, a collaborative model was adopted: the team trained residents to monitor seedlings, protect against wind and sand, and established a community-led water-saving irrigation plan, transforming residents from passive observers into active co-researchers.

After two growing seasons, the project has achieved encouraging preliminary results: the germination rate of laser-treated seeds increased by approximately 60% compared to the control group, the root development of seedlings was faster, the vegetation coverage in the demonstration plots significantly increased, topsoil stability was enhanced, and sand and dust mobility was reduced. More importantly, the thinned black saxaul shoots became supplementary fodder for local small livestock, bringing tangible benefits to residents. "Seeing barren land regain vitality, this sense of restored agency and hope is a vital resource for sustainable development," Prof. Obid Tursunov sighed. When summarizing the value of laser biotechnology in one sentence, he said: "Laser biotechnology uses the precision of light to unlock a plant's innate potential, allowing us to grow stronger crops and restore degraded land with less water and fewer chemicals, offering a gentle yet powerful tool to heal our planet."

Prof. Obid Tursunov also briefly introduced to me his China-Uzbekistan cooperative project— "Thermal Conversion of Agricultural Wastes for Bio-coal and Hydrogen-rich Syngas Production". Aiming at the characteristics of cotton stalks in Uzbekistan (high ash content and robust structure), the team adopted a low final pyrolysis temperature (450-500°C) and a moderate heating rate, prioritizing the production of high-quality bio-coal for carbon sequestration in degraded soils. For corn stover in China, which has low ash content and high volatile matter, a high final pyrolysis temperature (550-600°C) and a faster heating rate were selected to maximize the yield of hydrogen-rich syngas. Currently, the project

奥比德·图尔苏诺夫（中）以及来自中国农业大学的代表在乌兹别克斯坦撒马尔罕举办了能源、土木和农业工程国际会议

Obid Tursunov and delegates from China Agrcultural University hosted International Conference on Energetics, Civil and Agricultural Engineering in Samarkand, Uzbekistan.

点，团队采用450-500°C的低最终热解温度和中等升温速率，优先生产高质量生物煤，用于退化土壤的碳封存；而对于中国玉米秸秆灰分低、挥发分高的特性，则选择550-600°C的高最终热解温度和较快升温速率，最大限度提高富氢合成气产率。目前，项目已完成实验室规模可行性研究，进入中试示范阶段，在中国农业大学建立的连续进料中试规模热解反应器系统，正在进行长期运行测试。“我们的适应性热转化平台，能够有效处理两国不同的废弃物流，将区域环境挑战转化为清洁能源和土壤改良剂的生产机遇。”奥比德·图尔苏诺夫教授期待的说道。

研究项目最持久的遗产

科研路上从无坦途，奥比德·图尔苏诺夫教授分享了一段难忘的经历：早期将实

has completed laboratory-scale feasibility studies and entered the pilot-scale demonstration phase. A continuous-feed, pilot-scale pyrolysis reactor system established at China Agricultural University (CAU) is undergoing long-term operation testing. "Our adaptable thermal conversion platform can effectively handle the distinct waste streams of the two countries, transforming regional environmental challenges into opportunities for producing clean energy and soil amendments," Prof. Obid Tursunov said with anticipation.

The Most Enduring Legacy of Research Projects

There is no smooth path in scientific research. Prof. Obid Tursunov shared a memorable experience: in the early stage, when laser-treated seeds that performed excellently in the laboratory were put into field trials in semi-arid regions, the results were unexpected—the germination rate was far lower than that of the control group, and the seedlings grew slowly and were more susceptible to pests. After rigorous analysis and candid communication with partners, the

验室中表现优异的激光处理种子投入半干旱地区田间试验时，结果却出乎意料——发芽率远低于对照组，幼苗生长迟缓且易受虫害。经过严谨分析和与合作伙伴的坦诚沟通，团队找到了问题的根源。“这次失败比十几次‘成功’的实验室实验更能让我们了解植物生理学和实际应用的复杂性。”奥比德·图尔苏诺夫教授坦言，正是这次挫折，让团队从“刺激越多越好”的简单模型，转向对植物预处理和交叉耐受性的深入理解，也让国际合作更加牢固坦诚，形成了公开讨论挫折、集体解决问题的良好氛围。

作为资深学术导师，奥比德·图尔苏诺夫教授曾指导5名本科生、8名硕士生和2名博士生毕业，目前指导5名博士生（2名来自越南和津巴布韦）和1名理学博士生。“培养

team identified the root cause of the problem. "This failure taught us more about plant physiology and the complexity of practical applications than a dozen 'successful' laboratory experiments," Prof. Obid Tursunov admitted. It was this setback that led the team to move from the simplistic model of "more stimulation is better" to an in-depth understanding of plant priming and cross-tolerance. It also strengthened and made international cooperation more candid, creating a positive atmosphere of openly discussing setbacks and collectively solving problems.

As a senior academic supervisor, Prof. Tursunov has supervised 5 undergraduate students, 8 master and 2 PhD students to graduation, and currently supervises 5 doctoral students (2 from Vietnam and Zimbabwe) and 1 Doctor of Science (D.Sc.) student. "Cultivating the next generation of scientists is the most enduring legacy of any research program." The core of his guiding philosophy is to transform students from learners into independent, critical-

奥比德·图尔苏诺夫（左一）访问山东天鹅棉业机械股份有限公司新疆生产基地
Obid Tursunov (left 1) visited Shandong Swan Cotton Industrial Machinery Stock Co.,Ltd. in Xinjiang, China.

下一代科学家是任何研究项目最持久的遗产。”他的指导理念核心，是将学生从学习者转变为独立、批判性思维的创新者。“我提供工具和框架，学生的使命是利用这个基础，以自己独特的方式定义和解决下一代挑战。”他鼓励学生超越自己，在交叉学科领域探索新的可能。“不是培养出完美延续我工作的学生，而是培养出超越我的学生。”

“我们研究的真正成功，不在于发表的论文数量，而在于农民和地方机构对这些工具的广泛采用。”他秉持“节俭创新”理念，致力于研发坚固、低成本的硬件和简洁的操作流程，降低设备成本和操作门槛，让发展中国家的中小农户和地方环保部门都能用上这些先进技术。

他曾获得“乌兹别克斯坦2021年最高h指数青年科学家”“爱思唯尔Scopus奖–2019（乌兹别克斯坦）”等与研究影响力相关的荣誉，并于2024年和2025年被美国斯坦福大学和爱思唯尔评为“世界前2%科学家”。但在他看来，这些指标只是研究工作的“回响”，真正的科研影响力是可持续、自我强化的知识与行动循环。“当实验室的突破能够转化为卡拉卡尔帕克斯坦沙漠中一株株生长的黑沙蒿，而沙漠中的尘土又能为北京实验室的下一代实验提供启发时，才能实现最大的影响力。”

我想，这些穿越时间、赋能他人的知识体系，扎根现实、解决问题的技术路径，能薪火相传、启发未来的科研精神都是奥比德·图尔苏诺夫教授的研究项目最持久的遗产。

可持续未来的道路

深耕在激光生物技术领域多年，奥比德·图尔苏诺夫教授用三个关键词概括了自己的研究理念：“系统构建”，设计和强化生

thinking innovators. "I provide tools and frameworks, and the students' mission is to use this foundation to define and solve the next generation of challenges in their own unique way." He encourages students to surpass him and explore new possibilities in interdisciplinary fields. "The goal is not to cultivate students who perfectly continue my work, but to cultivate students who surpass me."

"The true success of our research lies not in the number of papers published, but in the widespread adoption of these tools by farmers and local agencies." Adhering to the philosophy of "Frugal Innovation", he is committed to developing robust, low-cost hardware and simple operational processes to reduce equipment costs and operational thresholds, enabling small and medium-sized farmers and local environmental protection departments in developing countries to access these advanced technologies.

He has received honors related to research impact, such as "2021 Highest h-index Young Scientist in Uzbekistan", "Elsevier Scopus Award–2019 (Uzbekistan)", and was recognized as the "World's Top 2% Scientist" by Stanford University (USA) and Elsevier in 2024 and 2025. However, in his view, these metrics are merely the "echo" of research work. The true impact of scientific research lies in a sustainable and self-reinforcing cycle of knowledge and action. "The greatest impact is achieved when a laboratory breakthrough can be translated into growing black saxaul (Haloxylon aphyllum) shrubs in the Karakalpakstan desert, and when the dust from that desert can inspire the next generation of experiments in a Beijing laboratory."

In my opinion, these time-transcending knowledge systems that empower others, reality-rooted and problem-solving technical pathways, and the scientific research spirit that is passed down and inspires the future—all these constitute the most enduring legacy of Prof. Obid Tursunov's research projects.

The Path to a Sustainable Future

Having been deeply engaged in the field of laser biotechnology for many years, Prof. Obid Tursunov summarizes his research philosophy with three key words: System Building: designing and strengthening various systems such as ecosystems, energy systems and research

奥比德·图尔苏诺夫（右二）访问了烟台的清洁炉灶生产公司，并就如何提高炉灶的效率和运行参数进行了讨论
Obid Tursunov (right 2) visited Clean Stove production company in Yantai and discussed on possible improvements of stoves' efficiency and operating parameters.

态、能源、团队等各类系统，增强其适应性和抗冲击性；“翻译者”，专注于基础科学与实际应用的交叉领域，在学科间、实验室与田间充当翻译者；“催化剂”，让技术成为解决挑战的催化剂，而非单纯的输出。

作为*Sustainability*、*Frontiers in Energy Research*等期刊的客座编辑，同时也是“土木和农业工程国际会议(ICECAE)”和“环境科学与技术国际会议(ICESTE)”的主导创建者，奥比德·图尔苏诺夫教授在策划期刊专题或会议主题时，有着自己结构化的判断标准。他向我解释，判断一个研究方向是否具有“行业前瞻性”，关键是看其是否同时应对紧迫全球挑战、符合政策市场趋势，并具备技术与经济可行性。他并非单纯选择热门话题，而是识别技术生命周期的关键节点，通过专题或会议集中力量推动领域发展，比如“二氧化

teams to enhance their adaptability and shock resistance; Translator: focusing on the nexus of fundamental science and practical applications, and acting as a translator between different disciplines as well as between the laboratory and the field; Catalyst: enabling technology to serve as a catalyst for addressing challenges rather than a mere technical output.

As a guest editor for journals such as *Sustainability* and *Frontiers in Energy Research*, and the initiator of the International Conference on Energetics, Civil and Agricultural Engineering (ICAECE), and International Congress on Environmental Science, Technology and Engineering (ICESTE) Prof. Obid Tursunov has his own structured criteria when planning journal special issues or conference themes. He explained to me that the key to judging whether a research direction is "industry forward-looking" lies in whether it can simultaneously address pressing global challenges, align with policy and market trends, and possess technical and economic feasibility. Instead of simply selecting popular topics, he identifies critical junctures in the technology lifecycle and concentrates

碳催化氢化”“生物质热转化”等方向的选择，正是基于这样的考量。

谈及未来规划，奥比德·图尔苏诺夫教授他计划开展SSR标记、基因表达分析等分子遗传研究和激素提取量化工作，从微观机制层面揭示激光生物技术的作用原理。面对跨学科人才短缺的挑战，他提出了“外部智力整合与内部能力建设”的双轨战略，既依托与中国农业大学和石河子大学等机构的合作获取先进设备和技术支持，又着力培养团队的分子生物学实操能力，弥补专业差距。

看似跨界的“去中心化电动汽车充电系统”研究，实则是他“环境-能源”核心工作的自然延伸。“我的研究始终专注于创建可持续、有韧性且循环的能源和资源利用系统。”奥比德·图尔苏诺夫教授解释道，生物质热解生产的清洁能源，最终需要在交通运输等关键行业替代化石燃料，而中亚地区老化的集中式电网难以支撑大规模电动汽车充电需求，去中心化充电系统恰好搭建了分布式可再生能源与清洁交通的桥梁。“这是应用我在多年环境能源研究中磨练的系统思维方法的完美跨学科挑战”。

每个人都是环境积极的守护者

对于全球相关科研领域的同仁，奥比德·图尔苏诺夫教授呼吁大家重点关注三大核心方向：从“精准化”转向“抗逆化”，设计预处理方案帮助生物体抵御干旱、盐碱化等胁迫；拥抱“节俭生物物理学”，优先研发坚固、低成本且用户友好的设备，推动技术普及；构建“深度融合”联盟，实现与分子生物学、数据科学和生态学的真正融合，解码核心机制以最大化系统影响力。

efforts to advance the development of the field through special issues or conferences. The selection of research directions such as CO_2 catalytic hydrogenation and biomass thermal conversion is precisely based on such considerations.

When talking about future plans, Prof. Obid Tursunov intends to carry out molecular genetic research including SSR markers and gene expression analysis, as well as hormone extraction and quantification, to reveal the mechanism of action of laser biotechnology at the micro-mechanism level. Faced with the challenge of interdisciplinary talent shortage, he has proposed a dual-track strategy of "External Intelligence Integration and Internal Capability Building"—relying on cooperation with institutions like China Agricultural University and Shihezi University to obtain advanced equipment and technical support, while also striving to cultivate the team's practical molecular biology capabilities to fill the professional gap.

The seemingly cross-domain research on decentralized electric vehicle (EV) charging systems is actually a natural extension of his core "environment-energy" work. "My research has always focused on creating sustainable, resilient, and circular systems for energy and resource utilization," Prof. Obid Tursunov explained. The clean energy produced by biomass pyrolysis ultimately needs to replace fossil fuels in key sectors such as transportation. However, the aging centralized power grids in Central Asia cannot support large-scale EV charging demands, and the decentralized charging system has exactly built a bridge between distributed renewable energy and clean transportation. "This is a perfect interdisciplinary challenge for applying the systems thinking approach honed through years of environmental and energy research."

Everyone is a Guardian of the Environment

To peers in relevant scientific research fields worldwide, Obid Tursunov calls on global researchers to focus on three core directions: shift from "precision" to "stress resistance-oriented"—design pretreatment schemes to help organisms withstand stresses like drought and salinization; embrace "frugal biophysics"—prioritize the development of robust, low-cost and user-friendly equipment to advance technology popularization; build a "cross-domain integration" alliance—

对于正在环境、能源或交叉学科领域探索的年轻研究者，他结合自身经历分享了三点经验：不要只追求新颖结果，要始终追问“谁将从中受益？”，让当地和生态挑战成为研究的指南针；做谦逊的终身学习者，主动学习其他学科“语言”，在交叉领域寻找创新方案；将实验失败和合作障碍视为前进路上的关键数据点，而非挫折，适应能力、学习能力和毅力是成功的关键。

对于关注环保与可持续能源的普通公众，奥比德·图尔苏诺夫教授传递了希望与集体行动的力量：“激光生物技术并非遥远的复杂科学，而是帮助自然更快、更有韧性恢复的‘精密手术刀’。”他呼吁每个人都成为“循环经济”的有意识参与者，用无数微小的行动共同构建可持续未来。“我们与环境并非相互分离，而是其积极的守护者，

achieve true synergy with molecular biology, data science and ecology, decode core mechanisms to maximize systemic impact.

For young researchers exploring environmental, energy, or interdisciplinary domains, he shared three lessons from his own experience: don't just chase novel results—always ask "Who will benefit from this?" and let local and ecological challenges guide research; be a humble lifelong learner—proactively learn the "language" of other disciplines and seek innovative solutions in interdisciplinary spaces; treat both experimental failures and successes as key data points on the path forward (not setbacks)—overcome obstacles through the combined force of capability, learning agility and perseverance.

For ordinary people concerned about the environment and sustainability, Prof. Obid Tursunov conveyed hope and the power of collective action: "Laser biotechnology is not a distant, complex science—it is a 'precision scalpel' that helps nature recover faster and more resiliently." He urges everyone to become a conscious participant in the "circular

奥比德·图尔苏诺夫（右一）访问中国海南三亚的椰子壳回收公司
Obid Tursunov (right 1) visited coconut shell recycling company in Sanya, Hainan China.

每一个行动都是地球恢复进程中的重要一环。”

真正有价值的科研，从来不是实验室里的孤芳自赏，而是扎根大地的直面现实挑战；真正有力量的创新，终将在解决实际问题的过程中，绽放出改变世界的力量。地球的“伤痕”或许需要漫长时间愈合，但在如奥比德·图尔苏诺夫教授一样的科研者、实践者的接力中，这最温柔也最坚定的“治愈力量”，终将蔓延向更广阔的荒漠与田野，让绿色的希望在科技的护航下，守护每一寸需要的土地。

economy", using tiny individual actions to jointly steer toward a sustainable future. "We are not separate from the environment; we are its active guardians—every action is a vital link in its restoration."

Truly valuable research is never self-admiration in the lab—it is about making tangible, meaningful changes to the earth; truly "substantial" innovation will ultimately bloom with solid impact in solving real-world problems. Healing the earth may take a long time, but in the relay of researchers and practitioners like Prof. Obid Tursunov, this most persistent "healing power" will eventually spread to broader deserts and fields. Under the escort of science and technology, green hope will guard every inch of land in need.

奥比德·图尔苏诺夫（右）和他的博士生正在干旱的咸海区域种植黑沙枣种子，进行田间实验
Obid Tursunov (right) and his PhD student carrying out field experiment by planting the seeds of black saxaul in the dry area of Aral Sea.