Established Models for "Autonomous Scientist" AI Agents in Scientific Discovery and the Role of Human Interaction Versus Human-in-the-Loop or Symbiotic Models

1. Introduction

The emergence of "autonomous scientist" AI agents marks a transformative shift in scientific discovery, with models now capable of independently generating hypotheses, designing and executing experiments, analyzing data, and even authoring scientific manuscripts (Lu et al., 2024; Yamada et al., 2025; Zhang et al., 2025; Ghafarollahi & Buehler, 2024; Ghafarollahi & Buehler, 2024; Kramer et al., 2023; Sparkes et al., 2010; King et al., 2009; Gower et al., 2024; Ifargan et al., 2024). These systems range from fully autonomous agents, such as The AI Scientist and its successors, to collaborative frameworks that integrate human oversight and symbiotic human-AI interaction (Lu et al., 2024; Yamada et al., 2025; Gao et al., 2024; Kitano, 2021; Goyal, 2025; Gottweis et al., 2025; Ifargan et al., 2024; Hastings, 2023; Sourati & Evans, 2023; Harada, 2023). Foundational models like the Autonomous Generalist Scientist (AGS) and multi-agent systems (e.g., SciAgents, DORA, ChemAgents) demonstrate the breadth of approaches, from end-to-end automation to modular, role-based collaboration (Zhang et al., 2025; Ghafarollahi & Buehler, 2024; Naumov et al., 2025; Song et al., 2025; Su et al., 2024). While some paradigms aim for minimal human intervention, others emphasize the necessity of human-in-the-loop or symbiotic models to ensure reliability, creativity, and ethical oversight (Gao et al., 2024; Kitano, 2021; Goyal, 2025; Bengio et al., 2025; Ifargan et al., 2024; Hastings, 2023; Sourati & Evans, 2023). The literature reveals a spectrum of autonomy, with ongoing debate about the optimal balance between AI-driven automation and human guidance in scientific research (Lu et al., 2024; Gao et al., 2024; Kitano, 2021; Goyal, 2025; Ifargan et al., 2024; Hastings, 2023; King et al., 2009). This review synthesizes the established models, their capabilities, and the evolving role of human interaction and oversight in these paradigms.

2. Methods

A comprehensive literature review was conducted using Consensus, searching over 170 million research papers from sources including Semantic Scholar and PubMed. The search identified 872 potentially relevant papers, screened 569 for eligibility, and included the top 50 most relevant and high-quality papers in this review. The search strategy involved 20 unique queries targeting autonomous scientist AI agents, foundational models, human-in-the-loop systems, and symbiotic human-AI paradigms.

Search Strategy

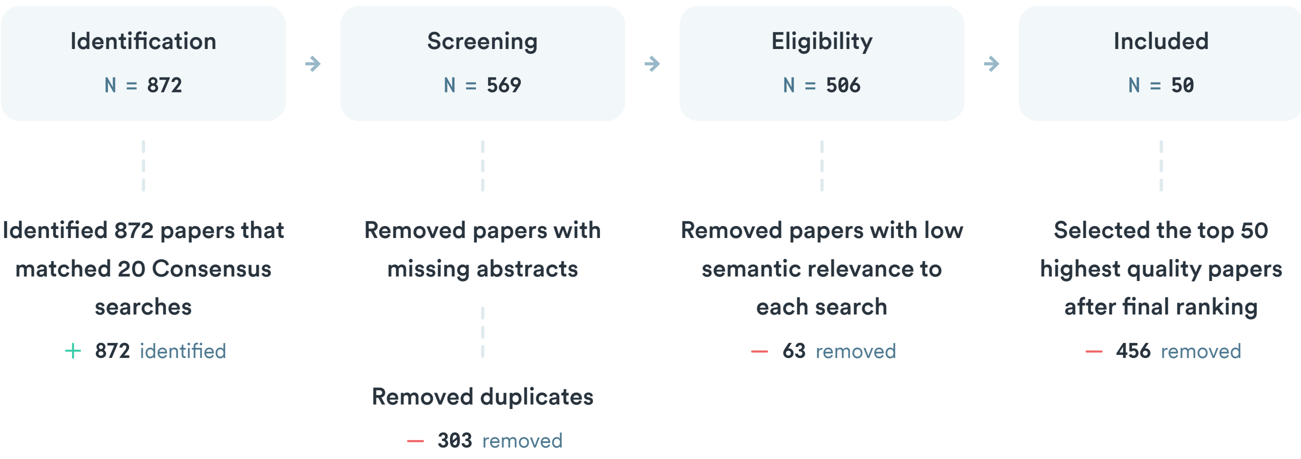

FIGURE 1 Flow diagram of the literature search and selection process.

Twenty unique searches were executed, focusing on models of autonomous scientific discovery, human-AI collaboration, and oversight frameworks.

3. Results

3.1. Established Models of Autonomous Scientist AI Agents

Recent years have seen the development of fully autonomous AI scientist agents, such as The AI Scientist and its v2 iteration, which can independently generate hypotheses, design and execute experiments, analyze results, and author scientific papers—sometimes even passing peer review without human intervention (Lu et al., 2024; Yamada et al., 2025). Other notable models include the Autonomous Generalist Scientist (AGS), which integrates agentic AI with robotics to automate the entire research lifecycle across disciplines (Zhang et al., 2025), and the Adam and Eve robot scientists, which pioneered closed-loop automation in genomics and drug discovery (Kramer et al., 2023; Sparkes et al., 2010; King et al., 2009). Multi-agent systems like SciAgents and DORA employ modular, role-based architectures to tackle complex scientific problems (Ghafarollahi & Buehler, 2024; Naumov et al., 2025; Ghafarollahi & Buehler, 2024; Song et al., 2025; Su et al., 2024).

3.2. Human-in-the-Loop and Symbiotic Models

While some systems strive for full autonomy, many frameworks emphasize human-in-the-loop or symbiotic models. These approaches integrate human creativity, domain expertise, and ethical oversight with AI's computational power and scalability (Gao et al., 2024; Kitano, 2021; Goyal, 2025; Gottweis et al., 2025; Ifargan et al., 2024; Hastings, 2023; Sourati & Evans, 2023; Harada, 2023). For example, biomedical AI agents are designed to collaborate with human scientists, planning workflows and performing self-assessment while allowing for human intervention at critical decision points (Gao et al., 2024). The Nobel Turing Challenge and several survey papers argue that human oversight remains essential for ensuring safety, reliability, and ethical compliance, especially as AI systems become more autonomous (Kitano, 2021; Goyal, 2025; Bengio et al., 2025; Ifargan et al., 2024; Hastings, 2023; King et al., 2009).

3.3. Comparative Analysis of Autonomy Levels

The literature describes a spectrum of autonomy, from AI as a research assistant (narrow, human-defined tasks) to AI as a collaborator (broader tool use and hypothesis generation) and, ultimately, to fully autonomous agents capable of independent scientific reasoning and discovery (Gao et al., 2024; Kramer et al., 2023; King et al., 2009). Some frameworks draw analogies to self-driving cars, with levels of autonomy ranging from passive tools to systems requiring no human intervention (Kramer et al., 2023; King et al., 2009). However, most real-world deployments still rely on varying degrees of human oversight, particularly for complex or high-stakes research (Gao et al., 2024; Kitano, 2021; Goyal, 2025; Ifargan et al., 2024; Hastings, 2023; King et al., 2009).

3.4. Key Themes and Challenges

Key themes include the need for transparency, reproducibility, and explainability in autonomous scientific discovery (Wang et al., 2023; Ifargan et al., 2024; Hastings, 2023; King et al., 2009). Challenges persist in benchmarking, evaluation, and ensuring that AI-generated discoveries align with human scientific values and standards (Reddy & Shojaee, 2024; Bengio et al., 2025; Ifargan et al., 2024; Hastings, 2023; Sourati & Evans, 2023). Ethical concerns, such as bias, misuse, and loss of human control, are frequently cited as reasons for maintaining human-in-the-loop frameworks (Kitano, 2021; Goyal, 2025; Bengio et al., 2025; Ifargan et al., 2024; Hastings, 2023; King et al., 2009).

Key Papers

Paper	Model/Framework	Autonomy Level	Human Interaction	Key Results
(Lu et al., 2024)	The AI Scientist	Fully autonomous	Minimal (peer review only)	Produced peer-review-accepted papers without human authorship
(Zhang et al., 2025)	Autonomous Generalist Scientist (AGS)	End-to-end automation	Optional	Automates research lifecycle across disciplines, integrates robotics
(Gao et al., 2024)	Biomedical AI Agents	Collaborative, modular	Human-in-the-loop	Combines AI and human expertise for biomedical discovery
(Kitano, 2021)	Nobel Turing Challenge	Hybrid (autonomous + human-in-the-loop)	Essential for safety/ethics	Proposes highly autonomous systems with human oversight
(Kramer et al., 2023)	Adam Robot Scientist	Closed-loop automation	Minimal (validation)	Discovered new gene functions in yeast autonomously

FIGURE 2 Comparison of key studies on autonomous scientist AI agents and human-AI interaction paradigms.

Top Contributors

Type	Name	Papers
Author	Ross D. King	(Kramer et al., 2023; Gower et al., 2024; Sparkes et al., 2010; King et al., 2009; Reder et al., 2023)
Author	Cong Lu	(Yamada et al., 2025; Lu et al., 2024)
Author	M. Zitnik	(Gao et al., 2024; Wang et al., 2023)
Journal	*ArXiv*	(Yamada et al., 2025; Lu et al., 2024; Zhang et al., 2025; Gridach et al., 2025; Naumov et al., 2025; Reddy & Shojaee, 2024; Ghafarollahi & Buehler, 2024; Gottweis et al., 2025; Cerrato et al., 2024; Liu et al., 2024; Kramer et al., 2023; Bengio et al., 2025; Gower et al., 2024; Ifargan et al., 2024; Schmidgall & Moor, 2025; Jansen et al., 2024; Zenil et al., 2023; Ament et al., 2021; Song et al., 2025; Desai et al., 2025; Behandish et al., 2022; Yin, 2024; Liu et al., 2024; Leskovec, 2025; Ferrag et al., 2025; Cao et al., 2024)
Journal	*Nature*	(Wang et al., 2023; Szymanski et al., 2023)
Journal	*Science*	(Gil et al., 2014; King et al., 2009)

FIGURE 3 Authors & journals that appeared most frequently in the included papers.

4. Discussion

The research landscape for autonomous scientist AI agents is rapidly evolving, with several models demonstrating impressive capabilities in automating the scientific process (Lu et al., 2024; Yamada et al., 2025; Zhang et al., 2025; Ghafarollahi & Buehler, 2024; Ghafarollahi & Buehler, 2024; Kramer et al., 2023; Sparkes et al., 2010; King et al., 2009). However, the literature consistently highlights the importance of human interaction and oversight, especially for ensuring scientific rigor, ethical compliance, and creative problem-solving (Gao et al., 2024; Kitano, 2021; Goyal, 2025; Bengio et al., 2025; Ifargan et al., 2024; Hastings, 2023; King et al., 2009). While fully autonomous systems like The AI Scientist and Adam have achieved notable milestones, most real-world applications still rely on human-in-the-loop or symbiotic models to address limitations in AI reasoning, data quality, and interpretability (Gao et al., 2024; Kitano, 2021; Goyal, 2025; Ifargan et al., 2024; Hastings, 2023; King et al., 2009). The field is moving toward hybrid paradigms that balance the scalability and efficiency of AI with the judgment and creativity of human scientists (Gao et al., 2024; Kitano, 2021; Goyal, 2025; Ifargan et al., 2024; Hastings, 2023; King et al., 2009).

Claims and Evidence Table

Claim	Evidence Strength	Reasoning	Papers
Fully autonomous AI scientist agents can independently generate, test, and publish scientific discoveries in some domains	Strong	Demonstrated by systems like The AI Scientist and Adam, which produced peer-reviewed research with minimal human input	(Lu et al., 2024; Yamada et al., 2025; Kramer et al., 2023; Sparkes et al., 2010; King et al., 2009)
Human-in-the-loop or symbiotic models are essential for ensuring reliability, creativity, and ethical oversight	Strong	Most frameworks and surveys emphasize the necessity of human guidance, especially for complex or high-stakes research	(Gao et al., 2024; Kitano, 2021; Goyal, 2025; Bengio et al., 2025; Ifargan et al., 2024; Hastings, 2023; King et al., 2009)
Multi-agent and modular systems enhance scalability and interdisciplinary research	Moderate	Multi-agent frameworks like SciAgents and DORA enable division of labor and integration of diverse expertise	(Ghafarollahi & Buehler, 2024; Naumov et al., 2025; Ghafarollahi & Buehler, 2024; Song et al., 2025; Su et al., 2024)
Current autonomous systems face challenges in transparency, reproducibility, and explainability	Moderate	Literature highlights ongoing issues with benchmarking, evaluation, and alignment with human scientific values	(Wang et al., 2023; Reddy & Shojaee, 2024; Bengio et al., 2025; Ifargan et al., 2024; Hastings, 2023; Sourati & Evans, 2023)
Fully autonomous scientific discovery without human oversight is not yet feasible for complex, open-ended research	Moderate	Most real-world deployments require human intervention for validation, creativity, and ethical decision-making	(Gao et al., 2024; Kitano, 2021; Goyal, 2025; Bengio et al., 2025; Ifargan et al., 2024; Hastings, 2023; King et al., 2009)
AI-driven scientific discovery poses ethical risks, including bias, misuse, and loss of human control	Moderate	Several papers discuss the need for ethical guidelines and human oversight to mitigate risks	(Kitano, 2021; Goyal, 2025; Bengio et al., 2025; Ifargan et al., 2024; Hastings, 2023; King et al., 2009)

FIGURE 4 Key claims and support evidence identified in these papers.

5. Conclusion

Autonomous scientist AI agents are reshaping the landscape of scientific discovery, with models ranging from fully automated systems to collaborative, human-in-the-loop frameworks. While fully autonomous agents have demonstrated remarkable capabilities, the consensus in the literature is that human interaction and oversight remain crucial for ensuring scientific rigor, creativity, and ethical responsibility. The field is moving toward hybrid paradigms that leverage the strengths of both AI and human scientists.

5.1. Research Gaps

Despite significant progress, gaps remain in benchmarking, evaluation, and the development of systems that can autonomously handle complex, open-ended scientific problems. There is also a need for more research on ethical frameworks, transparency, and the integration of human creativity and judgment in AI-driven discovery.

Research Gaps Matrix

Research Topic / Study Attribute	Fully Autonomous	Human-in-the-Loop	Multi-Agent	Interdisciplinary	Ethical Oversight
Hypothesis Generation	8	12	7	5	2
Experiment Design & Execution	7	10	6	4	2
Data Analysis & Interpretation	9	11	8	6	3
Manuscript Writing & Publication	5	8	4	3	1
Ethical/Legal Considerations	1	6	2	1	10

FIGURE 5 Matrix of research topics and study attributes, highlighting gaps in fully autonomous, interdisciplinary, and ethical oversight research.

5.2. Open Research Questions

Future research should focus on developing robust benchmarks, improving transparency and explainability, and exploring new models for human-AI collaboration in scientific discovery.

Question	Why
How can we ensure transparency and reproducibility in fully autonomous scientific discovery systems?	Transparency and reproducibility are critical for scientific credibility, yet current autonomous systems often lack clear mechanisms for traceability and validation.

These papers were sourced and synthesized using Consensus, an AI-powered search engine for research. Try it at ***https://consensus.app***

References

Yamada, Y., Lange, R., Lu, C., Hu, S., Lu, C., Foerster, J., Clune, J., & Ha, D. (2025). The AI Scientist-v2: Workshop-Level Automated Scientific Discovery via Agentic Tree Search. *ArXiv*, abs/2504.08066. **https://doi.org/10.48550/arXiv.2504.08066**

Lu, C., Lu, C., Lange, R., Foerster, J., Clune, J., & Ha, D. (2024). The AI Scientist: Towards Fully Automated Open-Ended Scientific Discovery. *ArXiv*, abs/2408.06292.

Zhang, P., Zhang, H., Xu, H., Xu, R., Wang, Z., Wang, C., Garg, A., Li, Z., Ajoudani, A., & Liu, X. (2025). Scaling Laws in Scientific Discovery with AI and Robot Scientists. **.

Gao, S., Fang, A., Huang, Y., Giunchiglia, V., Noori, A., Schwarz, J., Ektefaie, Y., Kondic, J., & Zitnik, M. (2024). Empowering biomedical discovery with AI agents. *Cell*, 187, 6125-6151. **https://doi.org/10.1016/j.cell.2024.09.022**

Wang, H., Fu, T., Du, Y., Gao, W., Huang, K., Liu, Z., Chandak, P., Liu, S., Van Katwyk, P., Deac, A., Anandkumar, A., Bergen, K., Gomes, C., Ho, S., Kohli, P., Lasenby, J., Leskovec, J., Liu, T., Manrai, A., Marks, D., Ramsundar, B., Song, L., Sun, J., Tang, J., Velickovic, P., Welling, M., Zhang, L., Coley, C., Bengio, Y., & Zitnik, M. (2023). Scientific discovery in the age of artificial intelligence. *Nature*, 620, 47-60. **https://doi.org/10.1038/s41586-023-06221-2**

Ghafarollahi, A., & Buehler, M. (2024). SciAgents: Automating Scientific Discovery Through Bioinspired Multi-Agent Intelligent Graph Reasoning. *Advanced Materials (Deerfield Beach, Fla.)*, 37. **https://doi.org/10.1002/adma.202413523**

Gridach, M., Nanavati, J., Abidine, K., Mendes, L., & Mack, C. (2025). Agentic AI for Scientific Discovery: A Survey of Progress, Challenges, and Future Directions. *ArXiv*, abs/2503.08979. **https://doi.org/10.48550/arXiv.2503.08979**

Kitano, H. (2021). Nobel Turing Challenge: creating the engine for scientific discovery. *NPJ Systems Biology and Applications*, 7. **https://doi.org/10.1038/s41540-021-00189-3**

Naumov, V., Zagirova, D., Lin, S., Xie, Y., Gou, W., Urban, A., Tikhonova, N., Alawi, K., Durymanov, M., Galkin, F., Chen, S., Sidorenko, D., Korzinkin, M., Scheibye-Knudsen, M., Aspuru-Guzik, A., Izumchenko, E., Gennert, D., Pun, F., Zhang, M., Kamya, P., Aliper, A., Ren, F., & Zhavoronkov, A. (2025). DORA AI Scientist: Multi-agent Virtual Research Team for Scientific Exploration Discovery and Automated Report Generation. *bioRxiv*. **https://doi.org/10.1101/2025.03.06.641840**

Goyal, M. (2025). A survey on the rise of the AI scientists: Accelerating discovery and confronting ethical frontiers. *World Journal of Advanced Engineering Technology and Sciences*. **https://doi.org/10.30574/wjaets.2025.15.2.0646**

Reddy, C., & Shojaee, P. (2024). Towards Scientific Discovery with Generative AI: Progress, Opportunities, and Challenges. **, 28601-28609. **https://doi.org/10.48550/arXiv.2412.11427**

Ghafarollahi, A., & Buehler, M. (2024). SciAgents: Automating scientific discovery through multi-agent intelligent graph reasoning. *ArXiv*, abs/2409.05556. **https://doi.org/10.48550/arXiv.2409.05556**

Gottweis, J., Weng, W., Daryin, A., Tu, T., Palepu, A., Sirkovic, P., Myaskovsky, A., Weissenberger, F., Rong, K., Tanno, R., Saab, K., Popovici, D., Blum, J., Zhang, F., Chou, K., Hassidim, A., Gokturk, B., Vahdat, A., Kohli, P., Matias, Y., Carroll, A., Kulkarni, K., Tomašev, N., Guan, Y., Dhillon, V., Vaishnav, E., Lee, B., Costa, T., Penad'es, J., Peltz, G., Xu, Y., Pawlosky, A., Karthikesalingam, A., & Natarajan, V. (2025). Towards an AI co-scientist. *ArXiv*, abs/2502.18864. **https://doi.org/10.48550/arXiv.2502.18864**

Cerrato, M., Schmitt, N., Baur, L., Finkelstein, E., Jukic, S., Münzel, L., Paul, F., Pfannes, P., Rohr, B., Schellenberg, J., Wolf, P., & Kramer, S. (2024). Science-Gym: A Simple Testbed for AI-Driven Scientific Discovery. **, 229-243. **https://doi.org/10.1007/978-3-031-78977-9_15**

Liu, H., Li, Y., Jian, J., Cheng, Y., Lu, J., Guo, S., Zhu, J., Zhang, M., Zhang, M., & Wang, H. (2024). Toward a Team of AI-made Scientists for Scientific Discovery from Gene Expression Data. *ArXiv*, abs/2402.12391. **https://doi.org/10.48550/arXiv.2402.12391**

Kramer, S., Cerrato, M., Džeroski, S., & King, R. (2023). Automated Scientific Discovery: From Equation Discovery to Autonomous Discovery Systems. *ArXiv*, abs/2305.02251. **https://doi.org/10.48550/arXiv.2305.02251**

Bengio, Y., Cohen, M., Fornasiere, D., Ghosn, J., Greiner, P., MacDermott, M., Mindermann, S., Oberman, A., Richardson, J., Richardson, O., Rondeau, M., St-Charles, P., & Williams-King, D. (2025). Superintelligent Agents Pose Catastrophic Risks: Can Scientist AI Offer a Safer Path?. *ArXiv*, abs/2502.15657. **https://doi.org/10.48550/arXiv.2502.15657**

Gower, A., Korovin, K., Brunnsåker, D., Kronström, F., Reder, G., Tiukova, I., Reiserer, R., Wikswo, J., & King, R. (2024). The Use of AI-Robotic Systems for Scientific Discovery. *ArXiv*, abs/2406.17835. **https://doi.org/10.48550/arXiv.2406.17835**

Ifargan, T., Hafner, L., Kern, M., Alcalay, O., & Kishony, R. (2024). Autonomous LLM-driven research from data to human-verifiable research papers. *ArXiv*, abs/2404.17605. **https://doi.org/10.48550/arXiv.2404.17605**

Gil, Y., Greaves, M., Hendler, J., & Hirsh, H. (2014). Amplify scientific discovery with artificial intelligence. *Science*, 346, 171 - 172. **https://doi.org/10.1126/science.1259439**

Schmidgall, S., & Moor, M. (2025). AgentRxiv: Towards Collaborative Autonomous Research. *ArXiv*, abs/2503.18102. **https://doi.org/10.48550/arXiv.2503.18102**

Szymanski, N., Rendy, B., Fei, Y., Kumar, R., He, T., Milsted, D., McDermott, M., Gallant, M., Cubuk, E., Merchant, A., Kim, H., Jain, A., Bartel, C., Persson, K., Zeng, Y., & Ceder, G. (2023). An autonomous laboratory for the accelerated synthesis of novel materials. *Nature*, 624, 86 - 91. **https://doi.org/10.1038/s41586-023-06734-w**

Hastings, J. (2023). AI for Scientific Discovery. **. **https://doi.org/10.1201/9781003226642**

Sparkes, A., Aubrey, W., Byrne, E., Clare, A., Khan, M., Liakata, M., Markham, M., Rowland, J., Soldatova, L., Whelan, K., Young, M., & King, R. (2010). Towards Robot Scientists for autonomous scientific discovery. *Automated Experimentation*, 2, 1 - 1. **https://doi.org/10.1186/1759-4499-2-1**

Sourati, J., & Evans, J. (2023). Accelerating science with human-aware artificial intelligence. *Nature Human Behaviour*, 7, 1682 - 1696. **https://doi.org/10.1038/s41562-023-01648-z**

Jansen, P., Côté, M., Khot, T., Bransom, E., Dalvi, B., Majumder, B., Tafjord, O., & Clark, P. (2024). DISCOVERYWORLD: A Virtual Environment for Developing and Evaluating Automated Scientific Discovery Agents. *ArXiv*, abs/2406.06769. **https://doi.org/10.48550/arXiv.2406.06769**

Zenil, H., Tegn'er, J., Abrahão, F., Lavin, A., Kumar, V., Frey, J., Weller, A., Soldatova, L., Bundy, A., Jennings, N., Takahashi, K., Hunter, L., Džeroski, S., Briggs, A., Gregory, F., Gomes, C., Williams, C., Rowe, J., Evans, J., Kitano, H., Tenenbaum, J., & King, R. (2023). The Future of Fundamental Science Led by Generative Closed-Loop Artificial Intelligence. *ArXiv*, abs/2307.07522. **https://doi.org/10.48550/arXiv.2307.07522**

Ament, S., Amsler, M., Sutherland, D., Chang, M., Guevarra, D., Connolly, A., Gregoire, J., Thompson, M., Gomes, C., & Dover, R. (2021). Autonomous synthesis of metastable materials. *ArXiv*, abs/2101.07385. **https://doi.org/10.1126/sciadv.abg4930**

Song, T., Luo, M., Zhang, X., Chen, L., Huang, Y., Cao, J., Zhu, Q., Liu, D., Zhang, B., Zou, G., Zhang, G., Zhang, F., Shang, W., Fu, Y., Jiang, J., & Luo, Y. (2025). A Multiagent-Driven Robotic AI Chemist Enabling Autonomous Chemical Research On Demand.. *Journal of the American Chemical Society*. **https://doi.org/10.1021/jacs.4c17738**

Desai, S., Addamane, S., Tsao, J., Brener, I., Swiler, L., Dingreville, R., & Iyer, P. (2025). AutoSciLab: A Self-Driving Laboratory for Interpretable Scientific Discovery. **, 146-154. **https://doi.org/10.1609/aaai.v39i1.31990**

Behandish, M., Maxwell, J., & Kleer, J. (2022). AI Research Associate for Early-Stage Scientific Discovery. *ArXiv*, abs/2202.03199.

Yin, X. (2024). "Turing Tests" For An AI Scientist. *ArXiv*, abs/2405.13352. **https://doi.org/10.48550/arXiv.2405.13352**

Liu, Z., Liu, K., Zhu, Y., Lei, X., Yang, Z., Zhang, Z., Li, P., & Liu, Y. (2024). AIGS: Generating Science from AI-Powered Automated Falsification. *ArXiv*, abs/2411.11910. **https://doi.org/10.48550/arXiv.2411.11910**

King, R., Rowland, J., Oliver, S., Young, M., Aubrey, W., Byrne, E., Liakata, M., Markham, M., Pir, P., Soldatova, L., Sparkes, A., Whelan, K., & Clare, A. (2009). The Automation of Science. *Science*, 324, 85 - 89. **https://doi.org/10.1126/science.1165620**

Harada, K. (2023). Co-evolution of Human and AI-Robots to Expand Science Frontiers. *Impact*. **https://doi.org/10.21820/23987073.2023.2.68**

Leskovec, J. (2025). From Retrieval to Reasoning: Advancing AI Agents for Knowledge Discovery and Collaboration. *Proceedings of the ACM on Web Conference 2025*. **https://doi.org/10.1145/3696410.3714542**

Ferrag, M., Tihanyi, N., & Debbah, M. (2025). From LLM Reasoning to Autonomous AI Agents: A Comprehensive Review. *ArXiv*, abs/2504.19678. **https://doi.org/10.48550/arXiv.2504.19678**

Reder, G., Gower, A., Kronström, F., Halle, R., Mahamuni, V., Patel, A., Hayatnagarkar, H., Soldatova, L., & King, R. (2023). Genesis-DB: a database for autonomous laboratory systems. *Bioinformatics Advances*, 3. **https://doi.org/10.1093/bioadv/vbad102**

Su, H., Chen, R., Tang, S., Yin, Z., Zheng, X., Li, J., Qi, B., Wu, Q., Li, H., Ouyang, W., Torr, P., Zhou, B., & Dong, N. (2024). Many Heads Are Better Than One: Improved Scientific Idea Generation by A LLM-Based Multi-Agent System. **.

Cao, S., Zhang, Z., Alghadeer, M., Fasciati, S., Piscitelli, M., Bakr, M., Leek, P., & Aspuru-Guzik, A. (2024). Agents for self-driving laboratories applied to quantum computing. *ArXiv*, abs/2412.07978. **https://doi.org/10.48550/arXiv.2412.07978**