ASPB Pioneer Member

Gerald Fink

Gerald R. Fink (also known as Gerry Fink) was an early advocate for the use of *Arabidopsis thaliana* molecular genetics to advance fundamental knowledge of plant science and improve agriculture. He made seminal discoveries enabling DNA transformation of yeast, understanding the regulation of amino acid biosynthesis, and elucidating mechanisms of invasive fungal growth. He mentored numerous postdocs and graduate students and taught courses at Cornell, MIT, and Cold Spring Harbor Laboratory that broadly and deeply impacted genetics. His research has been recognized with numerous awards, including the National Academy of Sciences Award in Molecular Biology (1981), the Genetics Society of America Medal (1982), the Emil Christian Hansen Award for Microbiology (1986), the George W. Beadle Award (2001), the Gruber Prize in Genetics (2010), and Thomas Hunt Morgan Medal by the Genetics Society of America (2020). He was elected to the United States National Academy of Sciences in 1981, to the Institute of Medicine in 1996, and to the American Philosophical Society in 2003. Beyond his own research, Gerry is a widely respected community leader, having served as president of the Genetics Society of America and the American Association for the Advancement of Science. He was Director of Whitehead Institute from 1990 to 2001, leading this preeminent research institute through major undertakings including creation of the Center for Genome Sciences (now The Broad Institute) and leadership as the largest private contributor to the Human Genome Project. In 2003, he chaired the National Research Council committee that created the influential report "Biotechnology Research in an Age of Terrorism: Confronting the Dual Use Dilemma," which provided the nation with critical guidance on how to meet the threat of bioterrorism without minimizing scientific progress.

Gerry was born in Brooklyn, New York in 1940. He was an undergraduate from 1958 to 1962 at Amherst College, a powerhouse of fruit fly geneticists who were trained by T. H. Morgan. Fascinated by genetics, he pursued graduate studies at Yale University with Norman Giles from 1962 to 1965, elucidating the histidine pathway in baker's yeast (*Saccharomyces cerevisiae*). Intrigued by the question of whether histidine genes in eukaryotes had an operon structure as in prokaryotes, Gerry did postdoctoral research on the histidine operon of *Salmonella* at the National Institutes of Health from 1965 to 1967 with Bruce Ames. He found that the histidine operon was regulated by tRNA in *Salmonella*. Gerry joined the faculty of Cornell University in 1967. At Cornell, he continued to tackle the operon question by studying the candidate operon region HIS4 in yeast. Through developing yeast transformation, his group propelled yeast into a keystone molecular genetic model organism that continues to underpin molecular biology studies today. His lab showed that yeast *HIS4*, unlike histidine genes in prokaryotes, is not part of an operon. Gerry's lab went on to discover the *GCN4* transcription factor that controls not only genes of histidine but arginine and others through the process of 'General Control' of metabolism [1]. In addition to revealing fundamental principles of eukaryotic transcriptional and translational regulation, this work influenced diverse fields of fundamental and applied biology. In 1982, Gerry became one of four founding members of the Whitehead Institute and a Professor of Genetics at MIT. Here, Gerry's lab used molecular genetics as a platform to initiate research in diverse areas including gene regulation, genome organization, cell biology, and fungal pathogenesis.

At MIT, Gerry became a pioneer in plant biology. This role stemmed

continued on next page

not only from his own research in plants, but also from his influential advocacy for modernizing plant biology. His 1989 commentary in *Cell* highlighted the importance of molecular biology and model organism research for plant science and agriculture, and he called on agricultural schools and federal funding agencies to support the emerging new plant biology [2]. His 1998 perspectives article in *Genetics* elaborated features of *Arabidopsis thaliana* that make it a model genetic organism and described the promises of this plant in attacking problems that were formerly impossible [3]. He noted, "Although there will be many surprises along the way, one thing is clear: The emergence of a reliable and facile model plant that instructs both basic research and agriculture will alter the course of science and, ultimately, the course of history." These insightful commentaries in prominent journals inspired a new generation of scientists to go into plant biology.

Gerry's Arabidopsis research at MIT spanned 1985 to 2001, conducted in parallel with his continuing yeast studies. His approaches brought the power of model microbial genetics to plant research, and many of his plant postdocs had trained in microbial genetics as graduate students. Having plant and yeast projects happening side-by-side in his lab enriched both groups. Application of negative genetic selections that kill wild-type plants led to new insights in tryptophan synthesis and auxin biology. Complementation of *E. coli* and yeast mutations by Arabidopsis cDNAs led to the cloning of genes of diverse functions and are an early example of the comparative biochemistry and genomics approaches currently being widely deployed. Similarly, hybridization screening of Arabidopsis libraries and genomic DNA led to identification of plant genes and early indications of the highly duplicated structure of plant genomes. His investigations led to publications on a wide variety of plant biology topics including tryptophan biosynthesis, auxin biosynthesis, lateral root formation, gravitropism, ion transport, salt tolerance, temperature responses and epigenetic controls [4-18].

Gerry Fink is a consummate biologist with broad and deep impacts on biology and a true Pioneer of plant biology. His varied approaches to a wide variety of problems in plant biology reveal his mastery of genetics, his naturalist spirit, and his eagerness to tackle interesting problems, even if doing so requires hard work and diverse approaches. In a recent essay [19], Gerry reflected on his love of the "Opening Game," tackling projects that had not been attempted. Like his other trainees, we are direct beneficiaries of this philosophy paired with his generosity in allowing us to pursue these projects after leaving his laboratory. His impact continues to be amplified as his former postdocs and students continue implementing the "awesome power of Arabidopsis genetics" that we learned and practiced in the Fink lab.

Jian Hua, Cornell University
Bonnie Bartel, Rice University
Robert Last, Michigan State University

References

1. Fink, GR (2009) Getting along with a little help from my friends. *J Bio Chem* **284:** 23885-23890.

2. Fink GR (1989) The state of plant molecular biology: is there a second chance for Ag schools? *Cell* **56:** 141-142.

3. Fink GR. (1998) Anatomy of a revolution. *Genetics* **149:** 473-477.

4. Last RL, Fink GR. (1988) Tryptophan-requiring mutants of the plant Arabidopsis thaliana. *Science* **240:** 305-310.

5. Last RL, Bissinger PH, Mahoney DJ, Radwanski ER, Fink GR. (1991) Tryptophan mutants in Arabidopsis: the consequences of duplicated tryptophan synthase beta genes. *Plant Cell* **3:** 345-358.

6. Niyogi KK, Fink GR. (1992) Two anthranilate synthase genes in Arabidopsis: defense-related regulation of the tryptophan pathway. *Plant Cell* **4:** 721-733.

7. Niyogi KK, Last RL, Fink GR, Keith B. (1993) Suppressors of trp1 fluorescence identify a new Arabidopsis gene, TRP4, encoding the anthranilate synthase beta subunit. *Plant Cell* **5:** 1011-1027.

8. Normanly J, Cohen JD, Fink GR. (1993) Arabidopsis thaliana auxotrophs reveal a tryptophan-independent biosynthetic pathway for indole-3-acetic acid. *Proc Natl Acad Sci USA* **90:** 10355-10359.

9. Bartel B, Fink GR. (1994) Differential regulation of an auxin-producing nitrilase gene family in Arabidopsis thaliana. *Proc Natl Acad Sci USA* **91:** 6649-6653.

continued on next page

ASPB Pioneer Member

GERALD FINK *continued*

10. Bartel B, Fink GR. (1995) ILR1, an amidohydrolase that releases active indole-3-acetic acid from conjugates. *Science* **268:** 1745-1748.

11. Celenza JL Jr, Grisafi PL, Fink GR. (1995) A pathway for lateral root formation in Arabidopsis thaliana. *Genes Dev* **9:** 2131-2142.

12. Hirschi KD, Zhen RG, Cunningham KW, Rea PA, Fink GR. (1996) CAX1, an H+/Ca2+ antiporter from Arabidopsis. *Proc Natl Acad Sci USA* **93:** 8782-8786.

13. Gaxiola RA, Yuan DS, Klausner RD, Fink GR. (1998) The yeast CLC chloride channel functions in cation homeostasis. *Proc Natl Acad Sci USA* **95:** 4046-4050.

14. Luschnig C, Gaxiola RA, Grisafi P, Fink GR. (1998) EIR1, a root-specific protein involved in auxin transport, is required for gravitropism in Arabidopsis thaliana. *Genes Dev* **12:** 2175-2187.

15. Diener AC, Li H, Zhou W, Whoriskey WJ, Nes WD, Fink GR. (2000) Sterol methyltransferase 1 controls the level of cholesterol in plants. *Plant Cell* **12:** 853-870.

16. Diener AC, Gaxiola RA, Fink GR. (2001) Arabidopsis ALF5, a multidrug efflux transporter gene family member, confers resistance to toxins. *Plant Cell* **13:** 1625-1638.

17. Gaxiola RA, Li J, Undurraga S, Dang LM, Allen GJ, Alper SL, Fink GR. (2001) Drought- and salt-tolerant plants result from overexpression of the AVP1 H+-pump. *Proc Natl Acad Sci USA* **98:** 11444-11449.

18. Hua J, Grisafi P, Cheng SH, Fink GR. (2001) Plant growth homeostasis is controlled by the Arabidopsis BON1 and BAP1 genes. *Genes Dev* **15:** 2263-2272.

19. Fink GR (2020) A Morgan Legacy. *Genetics* **216:** 611–612.