The Life and Work of Bruce Johnson at the Forest Products Laboratory and in the American Wood Protection Association

Grant Kirker
Rebecca E. Ibach
USDA-FS Forest Products Laboratory
Madison, Wisconsin

ABSTRACT

Bruce R. Johnson worked at the USDA Forest Service Forest Products Laboratory (FPL) from 1969-1994. His research as a Forest Products Research Technologist covered many aspects of wood durability and preservation. He was considered an expert on marine exposure of treated wood and wood based materials. His reports on marine performance of treated wood are influential publications still commonly cited in the current literature. To those of us who worked with him at FPL, Bruce was a motivating and inspiring colleague who loved his marine research, especially in Key West, Florida. Bruce was also heavily involved in standards and codes work for the American Wood Protection Association (AWPA) and made many contributions to marine specifications and describing biological biodeterioration hazards in marine exposure. Unfortunately, Bruce passed away in 2017 at the age of 75, but his memory lives on in his work and those of us who had the privilege of working with him. This paper is an accompaniment to the presentation given at the 115th Annual AWPA meeting in Orlando, FL.

Keywords: wood preservation, marine testing, Limnoria, timber bulkheads.

INTRODUCTION

The following proceedings paper was created as a tribute to the life and work of Bruce Johnson. Bruce was a Research Forest Products Technologist in the area of wood preservation from 1969 until 1994. Bruce passed away in April of 2017, but his memory lives on not only in filing cabinets and files at FPL, but through the lives that he touched and his service to the American public. Bruce is survived by his wife and best friend Sheila, who graciously provided various materials, notes and photographs from Bruce's personal office that were used throughout the presentation.

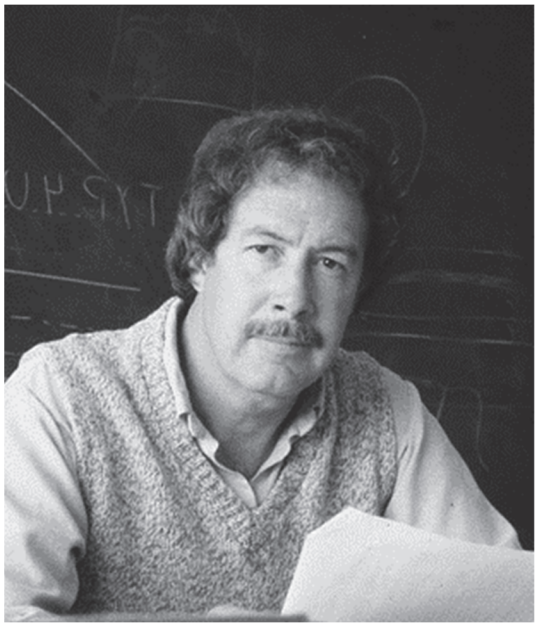

Figure 1. Portrait of Bruce Johnson.

Bruce Randall Johnson was employed at the USDA Forest Service Forest Products Laboratory (FPL) from 1969 to 1994. He made many lasting contributions in the area of marine testing of wood preservatives as he was responsible for samples exposed at field test sites in Key West, FL. A main focus of Bruce's work was double diffusion treatments which were intended to reduce damage by shipworms, phloads and *Limnoria*. Bruce also worked on the development of biochemically targeted wood protectants based on fungal chitin inhibition. Bruce also evaluated ammoniacal copper borate for use as a wood preservative in laboratory and field tests in which it was found to be ineffective. Bruce also worked with Becky Ibach on studying salt damage (Johnson, Ibach et al. 1992) to wood and served as her mentor when she started working in wood protection at FPL. Bruce was many things to many people, a brother, a husband, a father, a grandfather, a mentor, a colleague and a friend.

EARLY CAREER

Bruce's path to FPL was an interesting story in its own right. He did not finish high school and instead joined the Army at the age of 16 and was shipped off to Korea for seven years. He was based at Wolmido Island Army base in South Korea, this was a US occupied island from the Korean War that served as a staging point for US operations in the area up until it was closed. Currently this base serves as a public park in the city of Inchon. Bruce was a base radio operator and also worked with harbor patrol and was a chaplain's assistant.

Figure 2. Wolmido Island Army Base, South Korea where Bruce Johnson was stationed.

His experiences in Korea renewed his interest in education, so when he returned stateside, he began to pursue his college education. He finished a two-year associate degree at Stockbridge school of Agriculture and was accepted to the University of Massachusetts-Amherst where he obtained a Bachelor of Science (BS) in Forestry. He moved to Wisconsin in 1967 as a summer student worker and started a masters at the University of Wisconsin - Madison. He worked at FPL for a few years and decided to pursue a PhD, which he completed in 1980 (UW oral history project 2008).

This excerpt below was from a transcript from the UW History project from 2008 when Bruce was interviewed. It describes his first exposure to FPL where he met Dr. Robert Youngs, then division chief at FPL, who gave a lecture at Amherst about potential student opportunities at FPL. The following year Bruce, his wife Sheila, and their three sons then moved to Madison to start graduate school and a part time job at FPL. Bruce Johnson, while elaborating on his first exposure to FPL, said this, "In 1965, following my sophomore year (at UMass), we had a visit in one of our wood science classes, a seminar or something, from a Robert Youngs, a Dr. Robert Youngs who was, I think at that point he was sort of an Assistant Director, or I think then it was called Division Chief, at the Forest Products Lab. He came and spoke to us about careers in wood science research and specifically at the Forest Products Lab, and that really appealed to me." (Excerpt from UW Oral History Project 2008.)

FPL YEARS (1967-1994)

Bruce started out at FPL in Paints and Coatings. His master's dissertation dealt with how mold growth by *Trichoderma viride* effected the permeability of wood. He presented this work at the 1970 AWPA meeting in Chicago (Johnson and Gjovik 1970). He went on to publish several other papers in this area (Johnson 2007, unpublished FPL reports) but it never became his main research focus. Gil Comstock left FPL in the 70s to pursue work at Weyerhauser and Bruce was later reassigned to the wood preservation group where he worked for several years before deciding to go back and get his PhD. While in preservation, Bruce began focusing on marine exposure and installed the first of the Key West studies during this time.

Roy Baechler had a direct influence on Bruce and some of the work Roy was doing dealt with double diffusion treatments. Roy was a mentor to Bruce during his early years at FPL and convinced him that marine testing of some dual treated pilings would be an interesting opportunity for research. That study went out in 1969 and continued for the next 30 years.

In the mid-1970s Bruce was looking for a change. He was unsatisfied with the work he was currently doing and thought that getting a PhD would open up more opportunities for him at FPL. He became interested in the idea of using chitin inhibition to prevent wood decay. He used a soil bacterium derived antibiotic as a biocide. It showed good activity against decay fungi but had little effect on molds and stain fungi. Bruce is credited with pioneering the use of chitin inhibition as a targeted wood protection (Johnson 1980, Johnson and Chen 1983) and his work is well cited within that field and has stimulated other more recent works (Schmidt 1987, Persson et al. 1990, Illman 1994).

Bruce was heavily involved in marine testing mainly at the Key West Navy pier, but also had field test sites in Chesapeake Bay in WV. He was also involved with various conditions assessments in Boston and New York harbors and was very knowledgeable regarding shipworms, phloads, Limnoria and their associated damage. He has several publications addressing CCA tolerance of shipworms (Johnson and Lebow 1996), and distribution of *Sphaeroma* at the field sites in FL and other locations (Johnson, Estevez and Rice 1987, Benson et al. 1999).

Bruce evaluated ACB as a preservative. The lab tests gave positive results (Johnson and Gutzmer 1978) but field exposure was unsuccessful primarily due to leaching (Johnson 1983).

Bruce conducted field and lab studies in the late 1970s with Terry Amburgey (then at USDA-FS SRS Gulfport laboratory) on the use of gas phase ammonia treatments for millwork. There were two papers published from this work (Amburgey and Johnson 1979) for the field work and a lab study published in Phytopath (1978). The idea was that ammonia created an alkaline environment that would deplete thiamine levels in the sapwood and decrease fungal activity. The lab study indicated that the decrease in fungal activity was more likely due to inhibition of basidiospores. Gas phase ammonia treatments show up in the literature in the mid-2000s in Europe, which cites Bruce and Terry's work (Weigl et al., 2007, 2009).

AWPA INVOLVEMENT

Bruce was an active member during his 18 years at AWPA and served on various task forces in the T-2 and T-3 committees. He presented work on soft rot of preservative treated pine with Wallace Eslyn (AWPA 1986). He proposed the change to include a heartwood free requirement on all faces for SYP in marine bulkheads (AWPA, 1992) partly based on his work in that area with Roy Jackson (Johnson and Jackson 1990). He served as chair of the T-2 service records task force from 1982-1993 "to gather and analyze data on CCA treated marine pilings in service and ACA was later added to this instruction." (AWPA 1983). This TF coordinated the efforts of various researchers working in marine treatments and encompassed test sites in Key West, Miami and Daytona Beach, FL, a temperate site in Wrightsville Beach, NC and cold-water sites in Boston, MA and Friday Harbor, WA. He also created the Marine borer hazard map found in standard C3 (AWPA 1993).

POST FPL (1994-2016)

FPL was restructured in the early 1990's and Bruce opted for an early retirement (UW Oral History Project 2008). He bought some farmland outside Madison and built a house. He went on a lot of yachting adventures with Sheila and traversed the entirety of the great lakes and beyond. Bruce still kept up his annual trips to Key West where he still checked in on the marine tests up until about 2016. Bruce kept very detailed notes on the marine borer populations in and around the Key West site (Personal research notes courtesy of Sheila Johnson). The images below are of Bruce in action in 2002 rating some old specimens and the piling section pictured is one of the original samples from the 1969 double diffusion samples that was marine exposed for 33 years.

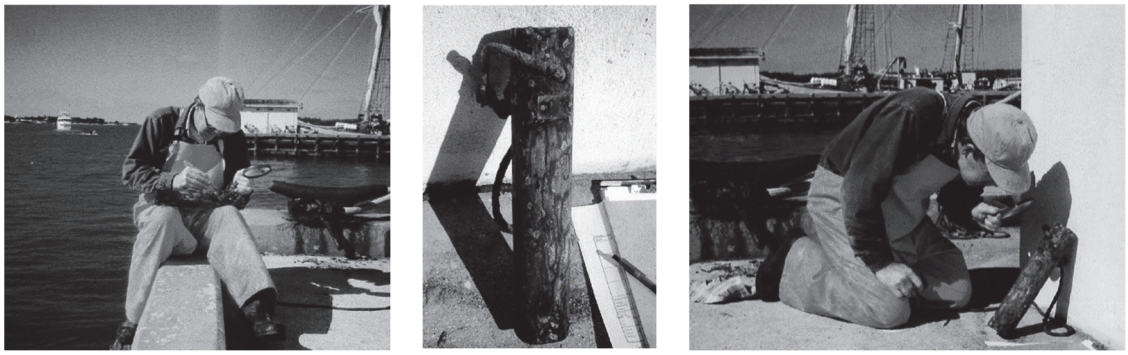

Figure 3. Images of Bruce Johnson rating old specimens and an image of the specimen up close.

ACKNOWLEDGEMENTS

The authors wish to offer our sincerest thanks to Sheila Johnson for her thoughtful contributions to this presentation. The UW Madison oral history project was also a very useful source in providing a thoughtful reflection by Bruce on his career in his own words.

REFERENCES

1. Amburgey TL, Johnson BR. Comparing ammoniation and water-repellent preservative treatments for protecting wood window units from decay. Forest Products Journal. 1979.
2. Amburgey TL, Johnson BR. Effect of ammonium hydroxide on thiamine and available micronutrients in ponderosa pine sapwood. Phytopathology. 1978 Jan 1; 68:951-4.
3. AWPA. 1983. Proceedings of the Annual Meeting of the American Wood Protection Association. AWPA, Birmingham, AL.
4. AWPA. 1986. Proceedings of the Annual Meeting of the American Wood Protection Association. AWPA, Birmingham, AL.
5. AWPA. 1992. Proceedings of the Annual Meeting of the American Wood Protection Association. AWPA, Birmingham, AL.
6. AWPA. 1993. Proceedings of the Annual Meeting of the American Wood Protection Association. AWPA, Birmingham, AL.
7. Benson LK, Rice SA, Johnson BR. Evidence of cellulose digestion in the wood boring isopod *Sphaeroma terebrans*. Florida Scientist. 1999 Apr 1:128-44.
8. Illman BL. In vitro effect of isatin on wood decay fungi. In Mycotoxins, Wood Decay, Plant Stress, Biocorrosion, and General Biodeterioration 1994 (pp. 307-315). Springer, Boston, MA.
9. Johnson B, Jackson R. Durability of heartwood in treated southern pine bulkheads. Forest Products Journal. 1990; 40(7/8):41-6.

10. Johnson BR, Chen GC. Occurrence and inhibition of chitin in cell walls of wood-decay fungi. Holzforschung-International Journal of the Biology, Chemistry, Physics and Technology of Wood. 1983; 37(5):255-9.
11. Johnson BR, Gjovik LR. Effect of Trichoderma viride and a contaminating bacterium on microstructure and permeability of loblolly pine and Douglas fir. In American Wood Preservers' Association. Proceedings 1970 (Vol. 66, pp. 234-240).
12. Johnson BR, Gutzmer DI. Ammoniacal copper borate: a new treatment for wood preservation. Forest products journal. 1978 Feb; 28(2):33-6.
13. Johnson, BR, Estevez, E.D., and S.A. Rice. 1987. *Sphaeroma terebrans* Bate: A Note on Distribution and Preservative Tolerance in Florida Coastal Waters. In Proceedings IRG Annual Meeting, IRG-WP 4135. The International Group on Wood Protection, Stockholm, Sweden.
14. Johnson BR, Gutzmer DI. Comparison of preservative treatments in marine exposure of small wood panels. US Dept. of Agriculture, Forest Service, Forest Products Laboratory; 1990.
15. Johnson BR, Lebow ST. Relative tolerance of CCA by larvae and adults of the common shipworm, *Bankia gouldi*. Material und Organismen. 1996 Jan 1; 30(1):73.
16. Johnson BR. A look at creosote vs. chromated-copper-arsenate salts as wood preservatives for the marine environment. Industrial & Engineering Chemistry Product Research and Development. 1982 Dec; 21(4):704-5.
17. Johnson BR. Effects of polyoxin inhibitors of fungal chitin synthesis on the decay of wood. INT. BIODETERIOR. BULL. 1982 Jan 1; 18(2):37-42.
18. Johnson BR. Field trials with ammoniacal copper borate wood preservatives. Forest Prod. J. 1983.
19. Johnson BR. Permeability changes induced in three western conifers by selective bacterial inoculation. Wood and Fiber Science. 2007 Jun 28; 11(1):10-21.
20. Johnson BR. Responses of wood decay fungi to polyoxin D, an inhibitor of chitin synthesis. Material und Organismen. 1980; 15(1):9-24.
21. Johnson, B.R. and Gutzmer, D.I., 1984. *Marine exposure of preservative-treated small wood panels* (Vol. 248). Forest Products Laboratory.
22. Johnson BR, Ibach RE, Baker AJ. Effect of saltwater evaporation on tracheid separation from wood surfaces. Forest Products Journal. 1992 Jul 1; 42(7/8):57-9.
23. Persson Y, Nordbring-Hertz B, Chet I. Effect of polyoxin D on morphogenesis of the nematode-trapping fungus *Arthrobotrys oligospora*. Mycological research. 1990 Mar 1; 94(2):196-200.
24. Schmidt EL. Influence of polyoxin D on basidiospore germination of two wood decay fungi. Mycologia. 1987 Jul 1; 79 (4):627-30.
25. Weigl M, Pöckl J, Grabner M. Selected properties of gas phase ammonia treated wood. European Journal of Wood and Wood Products. 2009 Feb 1; 67(1):103-9.
26. Weigl M, Pöckl J, Müller U, Pretzl H, Grabner M. UV-resistance of ammonia treated wood. In3rd European Conference on Wood Modification. 15th–16th October 2007 Oct.

Proceedings of the 115th Annual meeting of the American Wood Protection Association (AWPA), 115th annual AWPA meeting in Orlando, FL. pp. 100-104; 2019

PROCEEDINGS

One Hundred Fifteenth Annual Meeting

of the

AMERICAN WOOD PROTECTION ASSOCIATION

Loews Royal Pacific Resort
Orlando, Florida
May 5-7, 2019

VOLUME 115

AMERICAN WOOD PROTECTION ASSOCIATION
P O BOX 361784 • BIRMINGHAM, ALABAMA 35236-1784 • USA