LLOYD K. JACKSON'S LIFE AND WORK

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Lloyd Jackson was born in Fairbury, Nebraska, on August 25, 1922 and passed away in Lincoln, Nebraska, on April 15, 2009.

He received his A.B. degree from the University of Nebraska in 1943 and then served in the military as a meteorologist at an airbase in the Azores Islands for one and a half years. He subsequently returned to resume his graduate education at the University of Nebraska-Lincoln, where he received his M.A. degree in 1948. He then continued his graduate education at the University of California-Los Angeles and received his Ph.D. degree in mathematics under the direction of Edwin Beckenbach in 1950. In that same year, he accepted a position at the University of Nebraska-Lincoln, and except for a one year leave at the University of Utah in 1971–72, remained at the University of Nebraska-Lincoln until his retirement in 1984. He became the department's first chaired professor when he was named Regents' Professor in 1967, a position that he held until his retirement in 1984. Lloyd was a very distinguished member of the mathematics faculty at UNL and was internationally recognized for his work in differential equations. He was an important driving force in developing the department at UNL into a major research department.

During his career he served on the editorial boards of several journals, including the *Rocky Mountain Journal of Mathematics*, the *Journal of Nonlinear Analysis*, and the *SIAM Journal on Applied Mathematics*. He was the author of numerous pioneering and significant research articles. During the summer of 1967, he was one of the four principal speakers at an eight-week NSF sponsored conference held at the University of Colorado, Boulder. (The other principal speakers were Earl Coddington [UCLA], Wolfgang Wasow [University of Wisconsin-Madison], and John Barrett [University of Tennessee].) Lloyd's lectures at this conference were published as a very influential paper, *Subfunctions and Second Order Differential Inequalities*, Advances in Mathematics **4** (1968), 307–363.

His early research was concerned with extensions of the maximum principle and subfunctions of several variables. Three very noteworthy papers of this period were *Subfunctions of several variables*, Pacific Journal of Mathematics **3** (1953), 291–313, (with E.F. Beckenbach); *On generalized subharmonic functions*, Pacific Journal of Mathematics **5** (1955), 215–228; and *Subfunctions and the Dirichlet problem*, Pacific Journal of Mathematics **8** (1958), 243–255. In 1962, with the publication of the paper, *A generalized solution of the boundary value problem for $y'' = f(x, y, y')$*, Pacific Journal of Mathematics **12** (1962) (joint with L. Fountain), systematic investigations into properties of second-order nonlinear ordinary differential equations were begun. Over the next two decades, many results were obtained for solutions of nonlinear boundary value problems, by Lloyd and many of his students. One of the very interesting problems with which he was involved was the so-called "compactness condition for boundary value problems." This problem (whose solution for equations of n-th order was obtained in unpublished work by K. Schrader) occupied the attention of a number of researchers from the late 1960s to the 1990s. The proof for the case $n = 3$ appeared as *Existence and uniqueness of solutions of boundary value problems for third-order differential equations*, Journal of Differential Equations **9** (1971) 46–54, (joint with K. Schrader). A detailed discussion of this problem may also be found in a paper by R.P. Agarwal, *Compactness Condition for Boundary Value Problems*, Proceedings of EQUADIFF **9**, Brno, 1997.

In honor of Lloyd's 60-th birthday, a conference was held at the University of Nebraska-Lincoln in 1982, and the proceedings were published in a special issue of the *Rocky Mountain Journal of Mathematics* **12** (1982). Also on the occasion of his 75-th birthday, the issue of the journal *Mathematical and Computer Modelling* **32** (2000) was dedicated to him.

One of the hallmarks of Lloyd's lecturing style was his ability to clearly and concisely explain mathematics. This had a profound effect on the many graduate students who took courses from him over the years and did research under his direction. The following is a list of his Ph.D. students along with the year when they received their degree and their subsequent affiliation: Leonard Fountain (1960), San Diego State University; Elwood Bohn (1961), Miami of Ohio; Jerrold Bebernes (1962), University of Colorado-Boulder; John Herzog (1963),

Pacific Lutheran University; Kenneth Heimes (1965), Iowa State University; Ronald Mathsen (1965), North Dakota State University; Keith Schrader (1966), University of Missouri; Klaus Schmitt (1967), University of Utah; Lynn Erbe (1968), University of Alberta; Gene Klaasen (1968), University of Tennessee; Dale Peterson (1973), Chisago City High School; Joan Innes (1974), Creighton University; and Johnny Henderson (1981), Auburn University. Of these Ph.D. students, at least seven served as chairs of their department. Equally impressive is the list of Lloyd's mathematical progeny, which is now in its fifth generation with over 115 mathematical descendants.

Lloyd's quiet and unassuming manner endeared him to all of his friends, colleagues, co-workers, and students.

LLOYD K. JACKSON'S PUBLICATIONS

1. L.K. Jackson, *The principle of the maximum for generalized subharmonic functions*, Portugal. Math. **11** (1952), 69–74.

2. E.F. Beckenbach and L.K. Jackson, *Subfunctions of several variables*, Pacific J. Math. **3** (1953), 291–313.

3. L.K. Jackson, *On generalized subharmonic functions*, Pacific J. Math. **5** (1955), 215–228.

4. G. Blanch and L.K. Jackson, *Computation of harmonic measure by L. Ahlfors' method, Experiments in the computation of conformal maps*, National Bureau of Standards Appl. Math. Ser. **42**, U.S. Govt. Printing Office, Washington, D.C., 1955.

5. L.K. Jackson, *Subfunctions and the Dirichlet problem*, Pacific J. Math. **8** (1958), 243–255.

6. S.E. Bohn and L.K. Jackson, *The Liouville theorem for a quasi-linear elliptic partial differential equation*, Trans. Amer. Math. Soc. **104** (1962), 392–397.

7. L. Fountain and L.K. Jackson, *A generalized solution of the boundary value problem for $y'' = f(x, y, y')$*, Pacific J. Math. **12** (1962), 1251–1272.

8. L.K. Jackson and K. Schrader, *On second order differential inequalities*, Proc. Amer. Math. Soc. **17** (1966), 1023–1027.

9. J.W. Bebernes and L.K. Jackson, *Infinite interval boundary value problems for $y'' = f(x, y)$*, Duke Math. J. **34** (1967), 39–48.

10. L.K. Jackson and K.W. Schrader, *Comparison theorems for nonlinear differential equations*, J. Differential Equations **3** (1967), 248–255.

11. L.K. Jackson, *Disconjugacy conditions for linear third-order differential equations*, J. Differential Equations **4** (1968), 369–372.

12. L.K. Jackson, *Subfunctions and second-order ordinary differential inequalities*, Adv. Math. **2** (1968), 307–363.

13. L.K. Jackson and K.W. Schrader, *Subfunctions and third order differential inequalities*, J. Differential Equations **8** (1970), 180–194.

14. L.K. Jackson and G. Klaasen, *Uniqueness of solutions of boundary value problems for ordinary differential equations*, SIAM J. Appl. Math. **19** (1970), 542–546.

15. L.K. Jackson and K.W. Schrader, *Existence and uniqueness of solutions of boundary value problems for third order differential equations*, J. Differential Equations **9** (1971), 46–54.

16. L.K. Jackson and G. Klaasen, *A variation of the topological method of Wazewski*, SIAM J. Appl. Math. **20** (1971), 124–130.

17. L.K. Jackson, *Uniqueness and existence of solutions of boundary value problems for ordinary differential equations*, Ordinary differential equations (Proc. NRL–MRC Conf., Math. Res. Center, Naval Res. Lab., Washington, D.C., 1971), Academic Press, New York, 1972, 137–149.

18. L.K. Jackson, *Uniqueness of solutions of boundary value problems for ordinary differential equations*, SIAM J. Appl. Math. **24** (1973), 535–538.

19. L.K. Jackson, *Existence and uniqueness of solutions of boundary value problems for third order differential equations*, J. Differential Equations **13** (1973), 432–437.

20. J.E. Innes and L.K. Jackson, *Nagumo conditions for ordinary differential equations*, International Conference on Differential Equations (Univ. Southern California, Los Angeles, Calif., 1974), Academic Press, New York, 1975, 385–398.

21. L.K. Jackson, *A compactness condition for solutions of ordinary differential equations*, Proc. Amer. Math. Soc. **57** (1976), 89–92.

22. L.K. Jackson, *A Nagumo condition for ordinary differential equations*, Proc. Amer. Math. Soc. **57** (1976), 93–96.

23. L.K. Jackson, *Boundary value problems for ordinary differential equations*, Studies in ordinary differential equations, Stud. Math. **14**, Math. Assoc. of America, Washington, D.C., 1977, 93–127.

24. L.K. Jackson, *Existence and uniqueness of solutions of boundary value problems for Lipschitz equations*, J. Differential Equations **32** (1979), 76–90.

25. L.K. Jackson, *Boundary value problems for Lipschitz equations*, Differential equations (Proc. Eighth Fall Conf., Oklahoma State Univ., Stillwater, Okla., 1979), Academic Press, New York, 1980, 31–50.

26. J. Henderson and L.K. Jackson, *Existence and uniqueness of solutions of k-point boundary value problems for ordinary differential equations*, J. Differential Equations **48** (1983), 373–385.

27. L.K. Jackson and P.K. Palamides, *An existence theorem for a nonlinear two-point boundary value problem*, J. Differential Equations **53** (1984), 48–66.

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