

Fernandus Payne, Educator and Scientist

FRANK N. YOUNG
Department of Biology
Indiana University
Bloomington, Indiana 47405

Fernandus Payne (1881-1977) became chairman of zoology and dean of the graduate school at Indiana University in 1927, and served in those offices for more than 20 years. He was also, for a brief period, dean of the college of arts and sciences. yet during this long period of multiple duties in administration, he managed to carry on a productive and important program of research. He sometimes spent as much as six hours a day in his laboratory doing cytological or other types of work which may have led him to remark that he couldn't understand why some people thought college teaching was an easy job. This research, of course, was in addition to his other duties.

On leaving Indiana University in 1963, Salvador E. Luria, later Nobel Laureate, wrote Dean Payne, in part, as follows: "I am sincere in saying that the things that have been pleasant during my eight years with I.U.—and they have been the great majority—have been the product of what I have called the Payne spirit, something difficult to define but which has to do with consciousness of being in the main path out of mediocrity, a feeling of appreciation for what is relevant and of impatience for what is trivial. This I consider the essential thing in science, and you have shown me that it is also the main thing in administration. Looking back, I can see that what made I.U. an enjoyable place to me was the sense of recognition emanating, often imperceptibly, from the Dean's office in Biology Hall, a sort of shield and defense for the striving beginner against mediocrity and narrow-mindedness." (Memoirs and Reflections, 1972, pp. 130-131).

Fernandus Payne came to begin study at Indiana University by a devious path involving hard labor with a series of late 19th Century Indiana farm families, teaching in country schools, and finally attending a private normal school in Valparaiso, Indiana. From I.U. he went to Columbia University where he earned the Ph.D. degree with E.B. Wilson and T.H. Morgan in a then record two years time. From Columbia he returned to I.U., foregoing a prestigious postdoctoral fellowship at Johns Hopkins University. He remained at I.U. until his retirement in 1951, and continued his research in Bloomington until he reached the age of 90. Even after leaving Bloomington, however, he continued to write and prepared his *Memories and Reflections* (1972) and at least one technical paper which seems to have been lost.

Payne had several things going for him, perhaps the most important of which were his absolute honesty and his capacity for hard work. He was a man who believed in precision, but not in nit picking and trivialities. He did a great deal with the minimal educational background he managed to acquire before coming to I.U. as a student in 1902. He became not only a master administrator, but was a true scientific scholar. He remarked that he had worked with a variety of things, and perhaps would have done better to specialize, but then he really enjoyed his work both in education and biology. Perhaps one did not need to be a genius to get along with Payne, but I am sure Luria was right in recognizing his uncompromising attitude toward mediocrity and narrow-mindedness.

David Starr Jordan had instilled in his students at I.U. an interest in and respect for scientific research. Since there was no graduate school until late in the 19th Century, it was undergraduate students who received this message. A number subsequently went on to do significant research in later years. Carl H. Eigenmann continued Jordan's emphasis upon research. Thus, even as an undergraduate Payne was induced to begin a program of study of the eyes of a blind Cuban lizard (published 1906). These early

cytological studies were refined over his lifetime, ending with elegant electron microscope studies of the pituitary of the white Leghorn fowl.

During his graduate years at Columbia, he undertook two lines of research—one cytological on the chromosomes of *Gelastocoris*, a small semi-aquatic bug, and another on the effects of darkness on behavior and vision in *Drosophila*. The first of these resulted in the first demonstration of multiple X-chromosomes, and the second, a classical refutation of Lamarckian theory of evolution, in the introduction of *Drosophila* as a tool in research. Payne had taken the original stock of *Drosophila* with him to Columbia, and Morgan soon adopted it for his own research. Later Payne studied the inheritance of bristle number in *Drosophila* and even made studies of the effects of X-rays on inheritance in various invertebrates including *Drosophila*. Unfortunately, the latter experiments were inconclusive. Later H.J. Muller, using much the same techniques, demonstrated the mutational effects of X-rays for which he received the Nobel Prize. Later (1924) Payne published a paper describing the effects of chromosomal inversions (the Payne inversions) in *Drosophila*.

Payne admitted that he was a somewhat erratic researcher in the sense that he did not confine his interest to the head of the pin but worked widely in several fields of biology. His research with genetics at Columbia resulted in his introducing its study at I.U. despite the opposition of some of the "old guard." In cytology, he made a number of significant discoveries. The presence of multiple X-chromosomes in bugs (Hemiptera) was one, and he also demonstrated in the mole cricket, *Gryllotalpa*, that animals with very different chromosome complements might be morphologically indistinguishable. His extensive collection of slides of chromosomes of bugs and other insects remains at I.U. and may still produce knowledge in the future. He once told me that he had no interest in making a catalog, but was mainly looking for novelties. He also did pioneer work on the structure of the insect egg, and was among the first to recognize the involvement of the mitochondria with the nuclear material during spermatogenesis.

Payne was one of the first workers to recognize and describe the hydroid stage of the world-wide freshwater jellyfish, *Craspedacusta*. He also (1926) described one of the earliest human embryos known. His study of the latter embryo resulted in the production of a wax model by the workers at the Carnegie Laboratory in Washington.

Payne's most important work was probably with the endocrine glands of the fowl. In later years he defined the effects of aging in various endocrine glands in the fowl. He recognized the importance to cytology of the electron microscope, and taught himself to use that instrument after he was 70 years old. In 1949, when I first came to I.U., he was actively engaged in the study of the effects of aging on these glands. In cooperation with William R. Breneman, he was assaying the glands of a number of aged birds. These kept arriving from all over the United States, and I cannot say that any of them would have won an elegant fowl award. Some had very few feathers and other peculiarities associated with old age.

Eric L. Simmons, who received the Ph.D. from I.U. and only recently retired from the biology department of the University of Chicago, came to I.U. on an assistantship to work with Dean Payne in his cytological work. Payne had just returned from the Carnegie Laboratory on the Tortugas off Florida and was interested in studying *Ptychodera* which he had collected and fixed for sectioning. Eric says he worked really hard on preparing the material, but Payne made no comment until one day when Eric was in the cubbyhole behind the Dean's office he had been given to work in, he accidentally heard Payne talking to Breneman in the other room. Payne said, "Look at the cells in these slides. Simmons is doing a magnificent job!" Later Breneman, in his characteristic manner, clapped Eric on the back and said Payne thought he was doing a good job. Eric allowed that he wished Payne would tell him what he thought of his work. Breneman

responded, to the effect "Oh, you'd know if he didn't like your work. With his last assistant he would sit next door and throw the slides that he wasn't pleased with into the corner."

The attached bibliography represents the life work of Fernandus Payne in the biological sciences and most of his writing on education and its administration. An Indiana farm boy transformed himself through hard work and honesty into an eminent scientist and a master administrator.

Bibliography of Fernandus Payne

1906. The eyes of the blind vertebrates of North America, VII. The eyes of *Amphisbaena punctata*, a blind lizard from Cuba. Biol. Bull. 11:60-67 (Zoology Contribution #77).
1907. The reactions of the blind fish *Amblyopsis spelaeus* to light. Biol. Bull. 13:317-323 (Z.C. #89).
1908. On the sexual differences of the chromosome-groups in *Galgulus ocellatus*. Biol. Bull. 14:297-303.
1909. Some new types of chromosome distribution and their relation to sex. Biol. Bull. 16:119-168.
1909. The separated blastomers of centrifuged eggs of *Arbacia*. Sci., N.S. 30:934-935.
1910. The chromosomes of *Acholla multispinosa*. Biol. Bull. 18:174-179 (Z.C. #111).
1910. Forty-nine generations in the dark. Biol. Bull. 18:188-190 (Z.C. #112).
1911. *Drosophila ampelophila* bred in the dark for sixty-nine generations. Biol. Bull. 21:297-301 (Z.C. #120).
1912. A further study of the Reduviidae. J. Morph. 23:331-347 (Z.C. #124). II. The nucleolus of the young oocytes and origin of the ova in *Gelastocoris*.
1912. The chromosomes of *Gryllotalpa borealis*. Archiv fur Zellforschung 9:141-148 (Z.C. #126).
1913. A study of the effect of radium on the eggs of *Ascaris megatocephala univalens*. Archiv Entwicklunngsmech. d. Organismen 34:287-293.
1914. Chromosomal variations and the formation of the first spermatocyte chromosomes in the European Earwig, *Forficula* sp. J. Morph. 25:550-585 (Z.C. #134).
1916. A study of the germ cells of *Gryllotalpa borealis* and *Gryllotalpa vulgaris*. J. Morph. 28:287-327 (Z.C. #153).
1918. The effect of artificial selection on bristle number in *Drosophila ampelophila* and its interpretation. Proc. Natl. Acad. Sci. 4:55-58.
1918. An experiment to test the nature of the variations on which selection acts. Ind. Univ. Studies, Vol. 5, No. 36, pp. 1-45.
1920. Selection for high and low bristle number in the mutant strain *reduced*. Genetics 5:501-542 (Z.C. #173).
1921. The heredity of orange eye color in *Drosophila*. Am. Nat. 61:377-381 (Z.C. #182).
1922. (with M. Denny). A gynandromorph in *Drosophila melanogaster*. Am. Nat. 61:383-384 (Z.C. #191).
1924. A study of the fresh water medusa, *Craspedacusta ryderi*. J. Morph. 38:387-430 (Z.C. #199).
1924. Cross-over modifiers in the third chromosome of *Drosophila melanogaster*. Genetics 9:327-342 (Z.C. #200).
1925. General description of a 7-somite human embryo. Carnegie Inst. Wash. Pub. Cont. Emb. 81:115-124 (three plates) (Z.C. #201).
1926. Further studies of the life history of *Craspedacusta ryderi*, a fresh water Hydromedusan. Biol. Bull. 50:433-443 (Waterman Contrib. No. 22) (Z.C. #211).
1926. Some cytoplasmic structures in the male germ cells of *Galastocoris ocellatus*. J. Morph. Physiol. 43:299-345 (Waterman Contrib. #) (Z.C. #218).

1932. A study of the cytoplasm in insect ova. *J. Morph.* 53:523-591 (Waterman Contrib. #62) (Z.C. #229).
1931. The problem of the number and variety of graduate courses in education. Proceedings of the Association of American Universities, pp. 80-87.
1933. (with W.B. Munro and H.L. Dodds). Part III: College and University Teaching, pp. 36-103. Published by the American Association of University Professors as a special supplement (86 pages).
1934. Admission policy of Graduate Schools with reference to the "accepted list."
1935. (with E. Spieth). An open letter to college teachers. Principia Press, Bloomington, Ind., 380 pages.
1936. Early development of *Ptychodera bahamensis*. Carnegie Inst. Wash. Publ. 475:71-76 (Tortugas Lab. Papers #31) (Z.C. #246).
1937. Genetics and Evolution. *Sigma Xi Quarterly* 76:131-140.
1940. "Signet-ring" or "castration" cells in the chick. *Anatom. Record* 76, 8 pages. January 25, 1940 (Z.C. #280).
1940. *Graduate Education*. Read before National Society of Animal Production and published in their Journal.
1941. *Graduate Work—The Future*. Read at the 25th anniversary of the Establishment of the Graduate Faculty at Iowa State College. *Iowa State College Bull.* 39, No. 44, pp. 56-67.
1942. The cytology of the anterior pituitary of the fowl. *Biol. Bull.* 82 (1):79-111 (Z.C. #300).
1943. The cytology of the anterior pituitary of broody fowls. *Anat. Rec.* 86 (1):1-13 (Z.C. #316).
1944. Anterior pituitary-thyroid relationships in the fowl. *Anat. Rec.* 88 (4):337-350 (Z.C. #326).
1946. The cellular picture in the anterior pituitary of normal fowls from embryo to old age. *Anat. Rec.* 96 (1):77-91 (Z.C. #356).
1947. Effects of gonad removal on the anterior pituitary of the fowl from 10 days to 6 years. *Anat. Rec.* 97 (4):507-518 (Z.C. #362).
1949. Changes in the endocrine glands of the fowl with age. *J. Gerontol.* 4 (3):155-159 (Z.C. #399); (3) 193-199, 10 figs.
1950. Teaching of Science at the College Level. *Science*, 111, (2892):589-594.
1952. (with W.R. Breneman). Lymphoid areas in endocrine glands of fowl. *Poultry Sci.* 31:155-165 (Z.C. #438).
1952. Cytological changes in the cells of the pituitary, thyroids, adrenals, and sex glands of aging fowl. Chapter 16 in Cowdry's *Problems of Aging*, 3rd ed., pp. 381-401.
1952. Do mitochondria divide? *J. Exp. Zool.* 91:555-567 (Z.C. #489).
1955. Adrenal ganglia and medullary cells in hypophysectomized and aging fowl. *J. Exp. Zool.* 128:259-290 (Z.C. #569).
1955. Acidophilic granules in the gonadotropic secreting basophiles of laying hens. *Anat. Rec.* 122:49-56.
1957. A cytological study of the thyroid glands of normal and experimental fowl, including interrelationships with the pituitary, gonads, and adrenals. *J. Morph.* 101:89-130 (Z.C. #577).
1959. Cytologic evidence of secretory activity in the neurohypophysis of the fowl. *Anat. Rec.* 134 (3):433-454, 52 figs. (Z.C. #666).
1961. The pituitary of the fowl. A correction and addition. *Anat. Rec.* 140 (4):321-328 (Z.C. #702).
1965. Some observations on the anterior pituitary of the domestic fowl with the aid of the electron microscope. *Wistar Institute, J. Morph.* 117 (2):185-200 (Z.C. #765).

1966. Some observations on spermatogenesis in *Gelastrocoris oculatus* (Hemiptera) with the aid of the electron microscope. *J. Morph.* 119 (3):357-382 (Z.C. #794).
1972. *Memories and reflections*—Fernandus Payne, Indiana University, Bloomington, Ind., 1972, 133 pp., illus.

**References Including Descriptions and Evaluations of Research
by Fernandus Payne**

- Anon. 1971. Indianapolis Star Magazine, Nov. 28, 1971, pp. 48-52, 3 photographs.
- Carlson, E.A. 1985. Payne, Fernandus *in* Dictionary of Scientific Biography, Scribner's.
- Meserve, W.J. (editor). 1981. *Research and Creative Activity* (at Indiana University), Vol. 3:5.
- Young, F.N. 1955. Entomology-Work at Indiana University and Other Institutions and by Private Individuals Since 1854. *Proc. Indiana Acad. Sci.* 64:165-172.
- _____. 1983. A Brief History of Biology at Indiana University. *Proc. Indiana Acad. Sci.* Vol. 92:297-312, 1 fig.
- _____. 1986. The Giants of Zoology. *Proc. Indiana Acad. Sci.*, Vol. 95:371-374.

