= Ann Bishop (biologist) =

Ann Bishop (19 December 1899 ? 7 May 1990) was a biologist from Girton College at the University of Cambridge and a Fellow of the Royal Society , one of the few female Fellows of the Royal Society . She was born in Manchester but stayed at Cambridge for the vast majority of her professional life . Her specialties were protozoology and parasitology ; early work with ciliate parasites , including the one responsible for blackhead disease in the domesticated turkey , lay the groundwork for her later research . While working towards her doctorate , Bishop studied parasitic amoebae and examined potential chemotherapies for the treatment of amoebic diseases including amoebic dysentery .

Her best known work was a comprehensive study of Plasmodium , the malaria parasite , and investigation of various chemotherapies for the disease . Later she studied drug resistance in this parasite , research that proved valuable to the British military in World War II . She discovered the potential for cross @-@ resistance in these parasites during that same period . Bishop also discovered the protozoan Pseudotrichomonas keilini and worked with Aedes aegypti , a malaria vector , as part of her research on the disease . Elected to the Royal Society in 1959 , Bishop was the founder of the British Society for Parasitology and served on the World Health Organization 's Malaria Committee .

= = Life = =

Bishop was born in Manchester , England on 19 December 1899 . Her father , James Kimberly Bishop , was a furniture @-@ maker who owned a cotton factory inherited from his father . Her mother , Ellen Bishop (née Ginger) , was from nearby Bedfordshire . Bishop had one brother , born when she was 13 . At an early age , Bishop wished to continue the family business , though her interests quickly turned to the sciences after her father encouraged her to go to university . Appreciative of music from a young age , Bishop regularly attended performances of the Halle Orchestra in Manchester . As a researcher , she was introverted and meticulous , preferring to work alone or with other scientists whom she considered to have high standards . She was a fixture at Girton College for most of her life ; The Guardian dubbed her " Girtonian of Girtonians " in her obituary . A keen cook , she was also known for her annoyance at the lack of scientific measures in recipes she found .

Bishop was recognized at the College for her distinctive hats , which she would wear to breakfast every day before walking to the Molteno Institute , a distance of 3 @.@ 5 miles (5 @.@ 6 km) . She was skilled in needlework and appreciated the arts , though she did not like modern art . Her pastimes included walking and travelling , especially in the Lake District : however , she rarely left Britain . She also spent time in London at the beginning of each year , attending the opera and ballet and visiting galleries . Towards the end of her life , when her mobility was limited by arthritis , Bishop developed a fascination with the history of biology and medicine , although she never published in that field . Ann Bishop died of pneumonia at the age of 90 after a short illness . Her memorial service was conducted in the College 's chapel and was filled with her wide circle of friends .

= = Education = =

Educated at home until she was seven , Bishop then went to a private elementary school until the age of nine . In 1909 , then ten years old , she entered the progressive Fielden School in her hometown of Manchester , where she studied for three years . She completed her high school education at the Manchester High School for Girls . Though Bishop intended to study chemistry , her lack of education in physics meant that she could not pursue her preferred course in the Honours School of Chemistry . Instead , she matriculated at Manchester University in October 1918 to study botany , chemistry , and zoology . That first @-@ year course in zoology sparked her lifelong interest in and commitment to the field . She graduated with honours from the School of Zoology , receiving her Bachelor of Science degree in 1921 ; she received her master 's degree in 1922 .

During her undergraduate years , under the tutelage of the helminthologist R.A. Wardle and the protozoologist Geoffrey Lapage , Bishop studied ciliates acquired from local ponds .

Two years into her undergraduate career , after winning the John Dalton Natural History Prize awarded by the University , she began work for another protozoologist , a Fellow of the Royal Society , Sydney J. Hickson . In 1932 , she received her D.Sc. from Manchester University , for her work with the blackhead parasite . She received her Sc.D. from the University of Cambridge in 1941 , though it was in title only : women were not granted full degrees from Cambridge at this time .

= = Scientific career = =

= = = Early work = = =

Bishop 's undergraduate work with Hickson was her first major research effort , concerning the reproduction of Spirostomum ambiguum , a large ciliate that has been described as " wormlike " . In 1923 , while working at Manchester University , Bishop was appointed an honorary research fellow . In 1924 , she became a part @-@ time instructor for the Department of Zoology at Cambridge , one of only two women , both of whom were sometimes marginalised . For example , she was not allowed to sit at the table with the men of the department at tea : instead , she sat on a first @-@ aid kit . There , Bishop continued her work with Spirostomum as the only protozoologist on the faculty .

She left that position in 1926 , to work for Clifford Dobell at the National Institute for Medical Research where she stayed there for three years . Under Dobell , Bishop studied parasitic amoebae found in the human gastrointestinal tract , focusing on the species responsible for amoebic dysentery , Entamoeba histolytica . Dobell , Bishop , and Patrick Laidlaw studied the effects of amoebicides like emetine for the purpose of treating amoebal diseases . Later in her career , she named the amoeba genus Dobellina after her mentor .

= = = Molteno Institute = = =

The majority of her career was spent at Cambridge 's Molteno Institute for Parasite Biology , where she returned in 1929 . Her work there was an extension of her research with Dobell , as she studied nuclear division in parasitic flagellates and amoebae of diverse species , including both vertebrates and invertebrates . She isolated one type of protozoan , aerotolerant anaerobes , from the digestive tract of Haemopis sanguisuga during this period . Bishop also discovered a new species , Pseudotrichomonas keilini , which she named to acknowledge her colleague David Keilin , as well as the parasite 's resemblance to the genus Trichomonas . Her research at Manchester with H.P. Baynon concerned the identification , isolation , and study of the turkey blackhead parasite (Histomonas meleagridis) ; this study pioneered a technique for isolating and growing parasites from lesions on the liver . Bishop and Baynon were the first scientists to isolate Histomonas and then prove its role in blackhead . Bishop 's expertise with parasitic protozoa translated into her best @-@ known work , a comprehensive study of the malaria parasite (Plasmodium) and potential chemotherapies for the disease .

Between 1937 and 1938 , Bishop studied the effects of various factors , including different substances in blood and different temperatures , on the feeding behaviour of the chicken malaria (Plasmodium gallinaceum) vector , Aedes aegypti . She also examined factors that contributed to Plasmodium reproduction . This work became the basis for subsequent ongoing research into a malaria vaccine . Her subsequent work was spurred by the outbreak of the Second World War . During the war , she investigated alternative chemotherapies for malaria . Her research aided the British war effort because the most prevalent antimalarial , quinine , was difficult to obtain due to the Japanese occupation of the Dutch West Indies . From 1947 to 1964 , she was in charge of the Institute 's Chemotherapy Research Institute , associated with the Medical Research Council .

Bishop 's work evolved to include studies of drug resistance in both the parasites and the host organisms , the studies that would earn her a place in the Royal Society . Significant work from this

period of Bishop 's life included a study showing that the parasite itself did not develop resistance to quinine , but that host organisms could develop resistance to the drug proguanil . Her in vitro research was proven accurate when the drugs she studied were used to treat patients suffering from tertian malaria , a form of the illness in which the paroxysm of fever occurs every third day . She also investigated the drugs pamaquine and atebrin , along with proguanil , though proguanil was the only one shown to cause the development of drug resistance . Other studies showed that malaria parasites could develop cross @-@ resistance to other antimalarial drugs . Bishop worked at Molteno until 1967 . Her research and experimental protocols were later used in rodent and human studies , albeit with modifications .

= = = Honours and legacy = = =

Bishop received several honorary titles and fellowships during her career . In 1932 , she was appointed a Yallow Fellow of Girton College , an honour she held until her death in 1990 . Bishop was also a Beit Fellow from 1929 ? 1932 . The Medical Research Council awarded her a grant in 1937 that sparked her study of Plasmodium . In 1945 and 1947 , she was involved in organising Girton College 's Working Women 's Summer School , an institution designed to provide intellectual fulfilment for women whose formal education ended at the age of 14 . She was elected to the Royal Society in 1959 , and at one point was a member of the Malaria Committee of the World Health Organization .

The British Society for Parasitology was founded in the 1950s , largely due to Bishop 's efforts . She was initially given only five pounds and a secretary to start the Society ; in order to raise funds Bishop passed around a pudding basin at the Society 's meetings . The society was originally a subgroup of the Institute of Biology at Cambridge , but it became an independent group in 1960 and was headed by Bishop . She was the president of the group , called the Institute of Biology Parasitology Group , from 1960 @-@ 1962 , the third overall leader of the group . Later that decade , the Department of Biology asked her to be the department head , but she declined because of the public nature of the role . For 20 years , the scientific journal Parasitology had Bishop on staff as an editor . Her lifelong association with Girton College prompted the placement of a plaque commemorating her life , whose inscription , quoted from Virgil , reads " Felix , qui potuit rerum cognoscere causas " , Latin for " Happy is the one who has been able to get to know the causes of things " . In 1992 , the British Society for Parasitology created a grant in Bishop 's name , the Ann Bishop Travelling Award , to aid young parasitologists in travelling for field work where their parasites of interest are endemic .

= = Selected publications = =

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Bishop , Ann (1927) . " The cytoplasmic structures of Spirostomum ambiguum (Ehrenberg) " (PDF) . Quarterly Journal of the Microscopical Society 71 : 147 ? 172 .

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Bishop , Ann ; Dobell , Clifford (1929) . " Researches on the intestinal protozoa of monkeys and man . III : The action of emetine on natural amoebic infections in Macaques " . Parasitology 21 (4) : 446 ? 468 @.@ doi : 10 @.@ 1017 / S0031182000029334 .

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Bishop , Ann (1942) . " Chemotherapy and avian malaria " . Parasitology 34 (1) : 1 ? 54 @.@ doi : 10 @.@ 1017 / S0031182000015985 .
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Bishop , Ann ; McConnachie , Elspeth W. (1948) . " Resistance to sulphadiazine and ? paludrine ? in the malaria parasite of the fowl (p . Gallinaceum) " . Nature 162 (4118) : 541 ? 543 @.@ doi : 10 @.@ 1038 / 162541a0 .
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Bishop , Ann (1955) . " Problems concerned with gametogenesis in Haemosporidiidea , with particular reference to the genus Plasmodium " . Parasitology 45 (1 ? 2) : 163 ? 185 @.@ doi : 10 @.@ 1017 / S0031182000027542 .
Bishop , Ann ; McConnachie , Elspeth W. (1956) . " A study of the factors affecting the emergence of the gametocytes of Plasmodium gallinaceum from the erythrocytes and the exflagellation of the male gametocytes " . Parasitology 46 (1 ? 2) : 192 ? 215 @.@ doi : 10 @.@ 1017 / S0031182000026433 .
Bishop , Ann (1959) . " Drug resistance in protozoa " . Biological Reviews 34 (4) : 334 ? 500 @.@ doi : 10 @.@ 1111 / j.1469 @-@ 185X.1959.tb01317.x.