

Homage to Paul Langerhans

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The history of the two discoveries by which Paul Langerhans achieved immortality is now well known. He was just 21 when, in 1868, his paper "Ueber die Nerven der Menschlichen Haut" was published in Virchow's *Archiv* [1]. It described a short project in which he had stained human skin by the gold chloride method invented by his teacher, Cohnheim, and discovered the perplexing nonpigmentary dendritic cells which now carry his name. "Meine Untersuchungen habe ich im pathologischen Institut zu Berlin angestellt und mich der bereitwilligsten und freundlichsten Unterstützung von Seiten des Herrn Pro. Virchow sowohl als des Herrn Dr. Cohnheim zu erfreuen gehabt," he wrote, in generous acknowledgment of his mentors.

His second discovery, much better known to medical science, was that of the "islet" cells of the pancreas. During the summer of 1867 and then, after a gap of about a year, from the autumn of 1868, Paul pursued studies for his doctorate in medicine at the Berlin Pathological Institute, during which time he developed a close friendship with Rudolf Virchow. The Inaugural-Dissertation entitled "Beiträge zur mikroskopischen Anatomie der Bauchspeicheldrüse" was presented to the Medical Faculty of the Friedrich-Wilhelms University and defended publicly on February 18, 1869 [2]. Paul was very modest—indeed apprehensive—about his achievements. "Ich muss leider meine Mittheilungen mit der Erklärung eröffnen, dass ich in keiner Weise im Stande bin, die abgeschlossenen Resultate einer erfolgreichen Untersuchung vorzulegen, sondern höchstens wenige vereinzelte Beobachtungun beizubringen vermag, welche einen ungleich complicirteren Bau des untersuchten Objectes ahnen lassen, als man bisher annahm,"* he wrote. He then proceeded to describe a new type of cell in the pancreas of rabbits, which ultimately was to provide the key to the understanding and treatment of *diabetes mellitus*. The cells were in groups or "Häuflein" scattered through the parenchyma and quite distinct from the acinar cells which were known to secrete the pancreatic enzymes. Langerhans guessed nothing of their function. Not until a quarter of a century later, did the French histologist Laguesse find similar cells in the human pancreas, give them the name of "îlots de Langerhans," and suggest that they were the source of an internal secretion.

After he qualified, Paul Langerhans made some travels in the Middle East, served with an ambulance during the Franco-Prussian war and, in 1871, became prosector in pathology in Freiburg in Breisgau, where he stayed for 4 years and gained a full professorship. During this time he published, in *Virchow's Archiv*, several papers on histology and anatomy and one on *Petromyzon*. But because he suffered from pulmonary tuberculosis, he then settled in Madeira. Here, without any intimations of immortality he seems first to have devoted himself to zoological studies and later to medical practice. In 1885 he married Margarethe Ebart. During 3 "indescribably happy years" (in Margarethe's words) one daughter was born to them; then in 1888 Paul suffered a severe infection, kidney disease followed, and he died on July 20 at the age of only 41. "Mourned

deeply by his family, his patients, and his many friends" he was buried in the cemetery of the English Church.

Most of these facts are recorded in an introductory essay to an English translation of Langerhans' dissertation, published in 1937 by Dr. H. Morrison [3]. He lists some 15 works by Langerhans, 8 of them dated between 1868 and 1874, and the remainder, including a "Handbuch für Madeira" dealing with the climatic and curative possibilities of the island, as well as some clinical papers, between 1881 and 1888.

What engaged the imagination of Langerhans between 1874 and 1881? Morrison's list omits reference to any zoological works. Yet, a student of marine worms, having occasion to consult the excellent works of Pierre Fauvel [4,5] in the "Faune de France," or the great Ray Society Monographs on British Marine Annelids by William Carmichael McIntosh [6], could not fail to be impressed by the number of species bearing the name of Langerhans.

The "Zeitschrift für wissenschaftliche Zoologie for 1879" (Volume 32) contains a paper on "Die Wurmfauna von Madeira" which confirms that the zoologist is, indeed, the same Paul Langerhans of the dendritic cells and of the pancreatic islets (Fig 1). An unknown proof-reader bears eternal responsibility for the erroneous designation of the author as "Professor in Feiburg"!

Langerhans records that from October 1876 until March 1878, with the liberal support of the Berlin Academy of Sciences, he worked on the marine worm fauna of Madeira. He says that the task was more difficult than in the Mediterranean, because it was not so easy to get material from the fishermen (perhaps he had difficulty with the Portugese language). Nets were used only to fish the upper water; otherwise fishermen employed "Fischkörbe" (which were presumably made of material similar to that of the basket sledges used on the steep cobbled streets) or lines. Occasionally an old *Pinna* shell, a lump of coral or other material was hooked up, which was always a special bounty, because it provided specimens from depths of 30 to 100 fathoms. The "fish baskets" were "schwimmend erhalten" in a few fathoms depth, mostly near the coast. In the course of time they accumulate many organisms, and old baskets were rich finds. Apart from such material, Langerhans had to use his own resources. The beaches, such as they were, provided little; some were so barren that "Nicht einmal eine todte Muschel ist zu finden." The coast of Madeira is steep and the hundred fathom line is only about one nautical mile out, but Paul was able to use a dredge in about 40 fathoms in the Bay of Funchal.

In spite of these limited resources, Langerhans [7-10] was able to produce a series of 4 papers which must be considered as a major, indeed a monumental, contribution to the literature on invertebrates. Together they amount to 227 pages of text with an additional 12 folded plates, with 207 figures, a few in color, beautifully drawn by his own hand. In the first 3 papers he records and describes 153 different species of polychaete worms occurring in Madeira. Of these, no less than 57, about a third of the total he believed to be new species. One might be inclined, he said, to regard these as representatives of a West African fauna, but this was unlikely to be true for all of them; some would undoubtedly prove to be forms which also occurred on the coasts of France and England but which had not yet been definitively described. To support this view, he pointed out that of the other 96 known species, at least 72 had been found in the Mediterranean, and about half of these were also

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* (I must regretfully open my paper with the declaration that I am in no way able to give the completed results of a successful investigation, but at best to give a very few observations which may enable you to guess that the investigated objects have a much more complicated structure than hitherto assumed.)

Die Wurmfauna von Madeira.

Von

Dr. Paul Langerhans,
Professor in Feiburg.

Mit Tafel XXXI—XXXIII.

Vom October 1876 bis zum März 1878 habe ich mich in Funchal auf Madeira mit der Wurmfauna beschäftigt, unter Billigung und liberaler Unterstützung Seitens der Berliner Akademie der Wissenschaften.

Das Arbeiten dort hat gegen das Arbeiten auf den Mittelmeeresstationen den Nachtheil, dass man von den Fischern nur ausserordentlich selten Material erhalten kann. Netze haben dieselben nur zum Fischen an der Oberfläche; ausserdem wenden sie Fischkörbe und Angelleinen an. In die letzteren verwickelt sich bisweilen eine alte Pinna, ein Corallenstock und dergl.; das sind dann immer ergiebige Beutestücke, und sie mögen aus einer Tiefe von 30 bis gegen 400 Faden stammen. Ich habe die Thiere, die ich an ihnen fing, mit »aus grösserer Tiefe« bezeichnet. — Die Körbe werden in einige Faden Tiefe meist nahe der Küste schwimmend erhalten. An ihnen siedelt sich im Laufe der Zeit vielerlei an, und ein alter Korb ist darum eine reiche Fundgrube. Zweimal habe ich einen solchen mir verschaffen können.

Von diesen seltenen Objecten abgesehen, ist man ganz auf sich selbst angewiesen. Der Strand ist nur an wenigen Stellen zum Landen geeignet: er ist da mit sehr grossem Geröll bedeckt und vollkommen todt. Nicht einmal eine todtte Muschel ist zu finden. An anderen Stellen fallen zerklüftete Lavaströme ziemlich sanft ins Meer ab und sind im Bereich der Gezeiten in grobe Blöcke zerspalten; das ist namentlich westlich von der Pontinha der Fall, und dort ist in zurückbleibenden Tümpeln, unter Steinen u. s. w. reiche Ausbeute zu holen. Endlich senken sich steile Felsen senkrecht ins Meer, und diese sind dann mit

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FIG 1. First page of Langerhans' paper in vol 32 of the *Zeitschrift für wissenschaftliche Zoologie*, published in 1879.

taken on the oceanic coast of Europe, some types extending to the Arctic. In fact, Fauvel [4,5] later included at least 12 of the original 57 Langerhans species in the "Faune de France."

This was not all. Langerhans proposed the creation of 4 new genera of marine worms. To one he gave the name of *Virchowia* (Fig 2) presumably after his old friend and teacher, Rudolf Virchow; one wonders whether the recipient of this honor might have preferred the famous *Archiv* to be his memorial. Langerhans also included data on the Chaetognatha and the Nemeritini, and wrote a separate paper [11] about the Appendicularia (planktonic tunicates), on which he had given a lecture to the Royal Academy in Berlin in 1877. A fourth paper on the marine worms [10] described a further 20 species for the first time.

To what does Paul Langerhans owe his fame? Was it the good fortune of newly available histological methods? Were the cells and the islets just lucky discoveries, made by chance in the course of some otherwise rather dull micro-anatomical studies he made as an undergraduate?

It seems unlikely that either he or his contemporaries appreciated their potential importance. Langerhans' zoological work makes it clear that apart from his grasp of the literature and prodigious capacity for work, he was a superb and critical observer. Perhaps that is the true explanation of why he discovered new structures in the skin or realized that the pancreas was not just a simple "salivary" gland as previously believed.

Paul Langerhans lived in an era when broad interests in biology and medicine were perhaps more possible than now. His background was a help, for his father was a doctor and his mother a cousin of Franz Keibel, the famous embryologist and histologist. Before going to Berlin and developing his friendship with Virchow, Paul had studied in Jena where his "adored teacher" was Ernst Haeckel, propounder of the great dogma of Recapitulation and the idea that all metazoa were derived from an ancestral two-layered "gastreae."

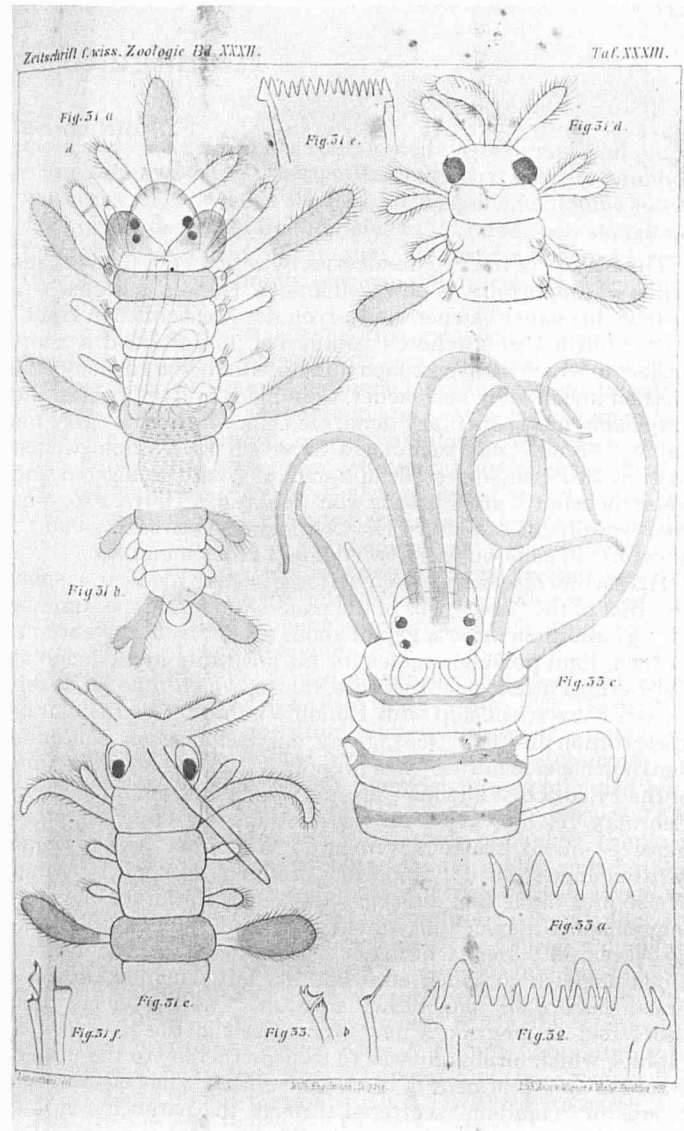


FIG 2. A plate from the 1879 paper with original drawings by Langerhans. The illustration on the top left (Fig. 31a and 31b) show the head and the tail of the asexual form of *Virchowia clavata*, a new genus and species named by Langerhans. Fig 31c (below) shows the male form and 31d (top right) the female form. Fig 33c illustrates another new species, *Proceraea fasciata*.

In this gathering of the 29th year of the Montagna Symposia, exactly 100 years after publication of the first paper on the worm fauna of Madeira, it seems especially apposite that we should join together in homage to Paul Langerhans.

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Announcement

The Skin Cancer Foundation is now accepting grant applications for research and clinical studies in the areas of cancer of the skin. Since the inception of the Foundation in April, 1979, over \$75,000 has been awarded for research, clinical studies, and public education.

The Skin Cancer Foundation is the only national organization concerned exclusively with cancer of the skin. Its major areas of interest are: a. To fund research into the causes, treatment, and prevention of skin cancer; and b. To educate primary care physicians in methods of early detection and prevention of skin cancers, and to support postgraduate fellowships to train physicians in the most advanced and sophisticated techniques of treatment. Inquiries should be addressed to: Grant Committee, The Skin Cancer Foundation, 475 Park Avenue South, New York, New York 10016.