

## Paul Langerhans (1847–1888): a centenary tribute

A Sakula MD FRCP Redhill General Hospital, Surrey

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The visitor to the island of Madeira may see, in the British cemetery in Funchal, the grave of Paul Langerhans who died in Madeira in 1888. The centenary of his death provides a suitable occasion to pay tribute to the life and work of this remarkable German pathologist whose histological discoveries included the pancreatic islets known eponymously as the islets of Langerhans.

Paul Langerhans (Figure 1) was born in Berlin on 25 July 1847, the son of a successful Berlin physician, Paul Langerhans senior (1820–1909) who was also a well known local government politician, becoming president of the Berlin City Council. His mother (née Keibel) was a cousin of the distinguished embryologist Franz Karl Julius Keibel (1861–1929). Two of Paul Langerhans' brothers were physicians - Robert (1859–1904) who was first assistant to Virchow and later occupied the Chair of Pathology and Richard, who practised in Berlin.

Langerhans began his medical studies in the University of Jena 1865/66, where one of his teachers was the eminent morphologist, Ernst Haeckel (1834–1919), and he then transferred to the Friedrich Wilhelm University, Berlin, where he was a student of Emil Du Bois-Reymond (1818–1896), Rudolf Virchow

(1821–1902) and Julius Cohnheim (1839–1884). He was chiefly influenced by the last two and became a close friend of Virchow.

Langerhans' first major histological discovery was in 1867, while still a medical student. Working in Virchow's laboratory at the Berlin Pathological Institute, he investigated the innervation of the skin, using the gold chloride staining technique developed by his teacher Cohnheim and he demonstrated the non-pigmentary dendritic cells or stellate corpuscles which now bear his name and which he described in his paper 'Ueber die Nerven der Menschlichen Haut' published in Virchow's *Archiv* (1868)<sup>1</sup>. Langerhans had no idea of the function of these cells which are now known to be derived from the bone marrow and to be macrophages which play a role in cell-mediated immunity.

In the same paper<sup>1</sup> Langerhans described the granular cells in the exterior portion of the Malpighian layer of the epidermis, the stratum granulosum otherwise known as the layer of Langerhans. (These cells described by Langerhans should not, of course, be confused with the Langerhans cells which were described by his contemporary, Theodor Langhans (1839–1915)<sup>2,3</sup>.)

Langerhans' most famous histological discovery, the pancreatic islets, was also made while still a medical student. During the summer of 1867 and then, after an interval of about a year, from the autumn of 1868 he pursued his researches for his MD thesis 'Beiträge zur mikroskopischen Anatomie der Bauchspeicheldrüse' (Figure 2), which he defended publicly on 18 February 1869<sup>4</sup>. In this medical classic, he described the microscopical appearance in the rabbit's pancreas of the acinar glandular cells which secrete the pancreatic digestive enzymes but scattered among them, in the inter-acinar spaces, were '... kleine Zellen von meist ganz homogenem Inhalt und polygonaler mit rundern Kern ohne Kernkörperchen meist zu zweien oder zu kleinen Gruppen beisammen liegende.' (English translation '... small cells of almost perfect homogeneous content and of a polygonal form, with round nuclei without nucleoli, mostly lying together in pairs or small groups.'<sup>5</sup>)

Langerhans admitted that he did not know the function of these special cells. It was not until 1893 that E Laguesse of Lille first postulated that these cells might produce an internal secretion and named them 'les îlots de Langerhans.' He wrote:

'Langerhans est le premier, la 1869, a signalé dans le pancreas adulte de petits amas en groupes de cellules speciales disseminés de place entre les acini, et à signification inconnue... Dans le pancreas d'un homme adulte je retrouve ces îlots très nombreux et volumineux (je les désignerai provisoirement sous le nom d'îlots de Langerhans).'<sup>6</sup>



Figure 1. Paul Langerhans 1885. (By courtesy of Wellcome Institute Library, London)

It was Laguesse's naming of these clumps of cells as *islets* which led, 30 years later, to the hormone they secrete being called *insulin*.

Following graduation, Langerhans worked for a while in Virchow's laboratory, together with FA Hofmann, on intravital staining for demonstrating the cells of the reticulo-endothelial system. In 1870, he travelled to Egypt, Palestine and Syria where, no doubt the result of Virchow's influence, he made several anthropological observations. During the Franco-Prussian war (1870-1871) he served with the German army as medical officer.

In 1871, Langerhans was appointed prosector in pathology at the University of Freiburg im Breisgau and was soon elevated to the chair of pathology. Among other projects, he continued his interest in the skin and investigated the tactile corpuscles.<sup>7</sup>

In 1874, aged 27, fate dealt him a heavy blow when he was diagnosed as having pulmonary tuberculosis and he was forced to abandon his academic career. Following unsuccessful attempts at a cure in Switzerland, Italy and Germany, he decided in 1875 to settle in Madeira, which was reputed to have a climate beneficial for sufferers from phthisis. Fortunately, his health improved and he was able to set himself up in medical practice in Funchal. An interest in deep sea fishing led him to pursue zoological studies on the marine fauna of the sea around Madeira. Corresponding with the Berlin Academy of Sciences, he was able to define more than 50 new varieties of marine worms, which he described in an important series of papers (1879-1984)<sup>8</sup>. Some of these varieties bear his name and he also named one genus *Virchowa* after his old teacher and friend, Rudolf Virchow. In addition, he described follicles (akin to the cells of the pancreatic islets) in the gut



Figure 3. Langerhans' grave in the British cemetery in Funchal, Madeira

of lower chordates, now known as the follicles of Langerhans.

Undoubtedly, the same keen observation powers which had enabled him to make his famous histological discoveries were now being put to good use in his zoological researches.

In 1885 he published an excellent *Handbook on Madeira*<sup>9</sup> and in the same year married Margarethe Ebert (née Jordan). A daughter was born to them. Three years later he became seriously ill with a renal infection and died in Funchal on 20 July 1888 at the tragically early age of 41.

He was buried in the British cemetery in Funchal (Figure 3). The inscription on his gravestone reads:

PROFESSOR PAUL LANGERHANS  
DOCTOR MEDICINAE  
GEB AM 23 JULI 1847  
ZU BERLIN  
GEST. AM 20 JULI 1888  
ZU FUNCHAL

Below this is the following epitaph in Greek (a quotation from Homer's *Odyssey* IV 539-540):

ΟΥΔΕ ΝΥ ΜΟΙ ΚΗΡ ΗΘΕΛ ΕΤΙ ΖΩΕΙΝ  
ΚΑΙ ΟΡΑΝ ΦΑΟΣ ΗΛΙΟΙΟ

The English translation is as follows: 'Nor did my heart wish any longer to be alive and see the light of the sun'.

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(Accepted 23 September 1987. Correspondence to Dr A Sakula, Pilgrims Corner, Pilgrims Way, Reigate, Surrey RH2 9LG)

## Beiträge zur mikroskopischen Anatomie der Bauchspeicheldrüse.

### INAUGURAL-DISSERTATION,

ZUR  
ERLANGUNG DER DOCTORWÜRDE

IN DER

## MEDICIN UND CHIRURGIE

VORLESUNG DER

### MEDICINISCHEN FACULTÄT

DER FRIEDRICH-WILHELM'S-UNIVERSITÄT

ZU BERLIN

UND ÖFFENTLICH SO VERTREIBEND

am 18. Februar 1869

VON

Paul Langerhans  
aus Berlin.

OPPONENTEN:

O. Locillet de Mars, Dd. med.  
O. Soltmann, Dd. med.  
Paul Ruge, Stud. med.

BERLIN.

BEI MEINER ZEIT VON GUSTAV LANGE.

Figure 2. Langerhans' MD Thesis 1869, title page