

Princess Vera's grave in the Korchevatskii cemetery on the outskirts of Kiev is marked by a metal cross in the Catholic rather than the Russian Orthodox style, befitting her Catholic origins

tuberculosis of the knee.<sup>19</sup> In 1929 she was appointed professor of surgery at the University of Kiev. This was quite an achievement for a princess. She had started to write her memoirs, which were very fictionalised but related to fact. They make up a cycle under the general title *Life* published in 1930 and 1931 but dealing only with her life up to 1904. She died in Kiev in 1932 at the age of 56. Who knows what she may have written about her later years, which surely must have been as full and exciting as any of the other professors of surgery about whom so much has been written.

The help given to a British army officer by Irina Fochkina (Moscow), Elena Chernyavskaya (Kiev), and Tanya Yeroshkina (St Petersburg) is gratefully acknowledged.

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## Themistocles Gluck: an unrecognised genius

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The nineteenth century witnessed the introduction of the foundations of modern surgery—namely, anaesthesia and asepsis. Total joint replacement, one of the most successful operations of modern times, is generally considered a development of the twentieth century. Yet the first total joint replacement was performed in Berlin in 1890. The tuberculous knee joint of a 17 year old woman was replaced by a hinged ivory prosthesis (fig 1). The surgeon was Themistocles Gluck (fig 2), whose pioneering work was dismissed during his lifetime and remains largely unrecognised to this day.

### The early days

Themistocles Gluck was born in Romania in 1853, the son of a famous German doctor who was the attending physician to the royal family. In 1873 Gluck started his preclinical medical studies in Leipzig and then continued in Berlin in 1875, where his teachers included Virchow, His, and von Langenbeck. From an early stage Gluck was interested in tissue replacement, and in 1878 he won a prize for research on nerve nutrition and regeneration that had been conducted with the help of Virchow.<sup>1</sup> After graduating he became the last assistant to von Langenbeck. Gluck obtained his higher surgical degree in 1882 and received the title of university professor in 1883, but he was unable to continue his university career. Langenbeck retired and was replaced by von Bergmann, who could find no place for the young Gluck. Gluck then worked for a short time in Bucharest but returned after his hopes of a surgical chair there were dashed. He practised industrial medicine in Berlin until 1890, when he was appointed to the post of head of surgery at the Emperor Frederick Paediatric Hospital in Berlin.<sup>2</sup>

Gluck's early experimental work concerned organ resection and transplantation. His thesis was entitled "On the extirpation of organs" and his main hypothesis was that after the loss of one of a paired organ the remaining organ would take over the total function. Tendons and nerves were harvested from cadavers, disinfected, and transplanted into recipient animal donors. Gluck saw no ethical dilemma in transplantation and speculated on the size of a tissue transplant that could be tolerated by humans. After experimenting

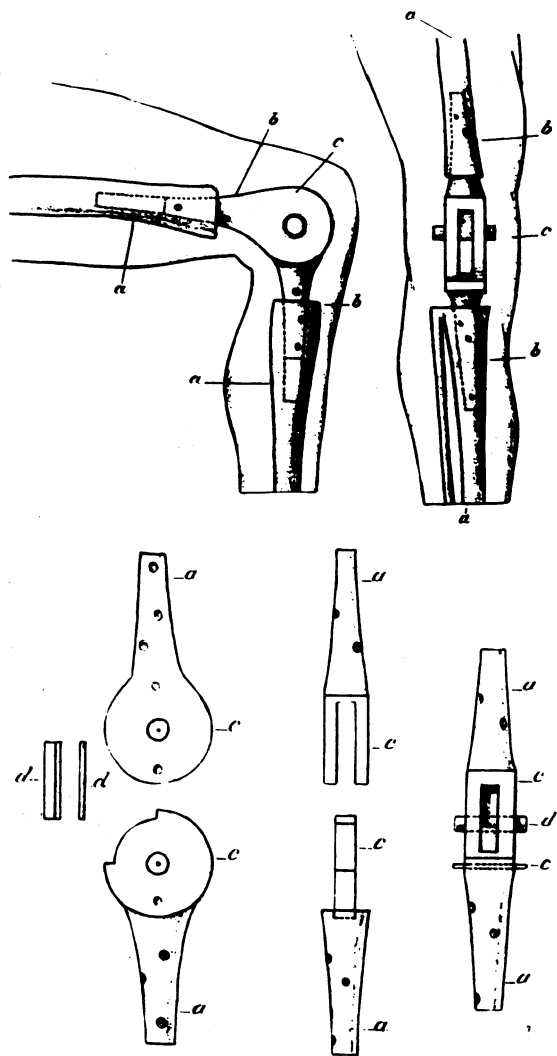


FIG 1—Ivory total knee arthroplasty, with exploded view of knee prosthesis showing slots for horizontal fixation pegs

with autologous transplantation and heterologous transplants in animals he began to work with foreign materials. He successfully bridged tendon, muscle,

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BMJ 1992;305:1534-6

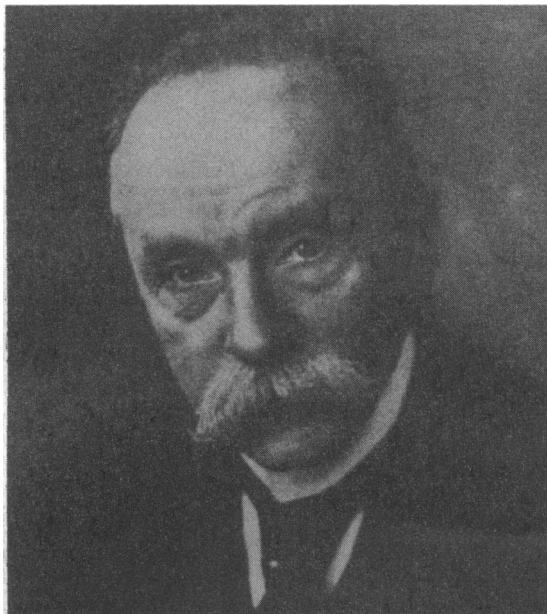


FIG 2—Themistocles Gluck, 1853-1942

and bone defects by interposing silk and catgut suture bundles, which encouraged fibrous tissue formation, a process he called "autoplastic."<sup>3</sup>

During the Serbian-Bulgarian war (1885-6) Gluck fixed the ends of a fractured femur with two steel plates secured to the bone with screws. He was amazed at how early the injured limb could resume movement. Around this time he replaced a portion of a mandible resected for cancer with a steel plate fixed to the bone with screws, with an excellent result.

#### Pioneer of joint replacement

Much of Gluck's early work was an attempt to develop "guide rails" for tissue regeneration. He then went one step further and tried to provide definitive tissue replacements, in particular for bone and joint defects. Various materials were used in animal trials, including aluminium, wood, glass, and nickel plated steel, but he opted for ivory as the most important material<sup>1</sup>—a decision that was perhaps influenced by the fact that the Ivory Coast was then a German colony. After using ivory cylinders to bridge bone defects in animals he impacted ivory cylinders into the medullary canal in patients with fractured long bones. Not only was bone continuity restored but secure fixation was also achieved. These ivory cylinders were a forerunner of the Küntscher nail. The fixation was later supplemented by small ivory pegs (fig 1) driven into horizontal drill holes. A connection that allowed movement at the level of the implant was a further improvement. Gluck rapidly developed models for the total replacement of shoulder, elbow, hand, and knee joints.<sup>4</sup>

Gluck also considered the fixation of the prosthesis to the skeleton. He was the first surgeon to use bone cement and he experimented with a variety of substances, including copper amalgam, plaster of Paris, and stone putty (rosin with pumice stone or gypsum), which hardened rapidly after mixing. He thus predated the work of Sir John Charnley by 65 years. The implants could be well fixed with cement, but he favoured osseointegration: the stability of the implant guaranteed by bone ingrowth alone. "Cement or cementless" continues to be a controversial issue.

Gluck realised that his implants needed to be biomechanically sound: "We must aim for smaller volume and lower weight, together with strength and the most efficient shape, basing our efforts on the structural principles of the human skeleton." He

emphasised the need for ease of application and atraumatic surgery: "The devices must be easy to insert through small wounds. Even if the device is technically complicated, ingeniously made and movable in different directions, it must not give rise to operative difficulty."<sup>5</sup>

The first ivory knee replacement on 20 May 1890 was followed by a total wrist replacement in another patient three weeks later. All the joint arthroplasties were remarkably successful in the short term. Later in 1890 Gluck presented a further case of a total knee replacement to the Berlin Medical Society: at only 35 days after operation the patient was pain free with active knee flexion and extension.

#### Criticism

In 1890 Gluck was due to present his arthroplasty work to the tenth international surgical congress in Berlin. He believed that people had to visualise ideas before they could be convinced of the value of them. He therefore had a complete skeleton fitted with his various arthroplasties, which by now included the wrist, elbow, shoulder, ankle, hip, and knee. This became famous as the "skeleton of Paris" and was exhibited until the second world war, when it disappeared into Russia along with the famous Berlin Medical Collection.<sup>1</sup>

Earlier in 1890 his former teacher, the president of the German surgical association, Professor von Bergmann, had criticised Gluck's use of silk sutures to bridge tendon defects. While Gluck was preparing his presentation his colleagues were plotting to prevent his lecture. Bergmann wrote to Gluck, "As the leader of German surgery I cannot allow that you discredit German science in front of a platform of international surgical specialists. My pupils and I will fight you with all means." Although Gluck's joint replacements were spectacularly successful in the short term, all ultimately failed because of chronic infection. A report of five cases was published, all tuberculous joints. Three prostheses were subsequently removed, but one knee and one wrist replacement were left in situ despite fistula formation. Gluck, a rigid follower of asepsis, later realised that prior joint infection was a contraindication to joint replacement. Sadly, because of the opposition of his colleagues, Gluck stopped this work altogether and abandoned his presentation to the international congress.

#### Diversity and honours

The dismissal of his work on joint replacement did not diminish Gluck's enthusiasm for research in other areas of medicine. He described several surgical operations, including laryngectomy, preventive resection of the trachea, lung resection, and use of a plate for the repair of inguinal hernias. He also wrote on the treatment of thrombophlebitis and peritonitis, investigation of kidney function, chemotherapy, and functional orthopaedics. He recognised that experimental surgery on various animal species was the only way to achieve decisive progress. Only after extensive and successful animal trials were total joint replacements carried out in human patients.

In his later years Gluck was honoured for his work. In 1922 he was made an "extraordinary professor" and in 1930, at the age of 77, he was invited to join the honour roll of the German Surgical Society. On his 80th birthday a special biography was published by the German orthopaedic surgeon Fritz Lange.<sup>6</sup> Gluck died aged nearly 90 on 25 April 1942 in Berlin.

During his life Gluck openly rejected the view of the famous physiologist Claude Bernard<sup>7</sup> that, however skilful surgeons may be, they could not alter the laws of

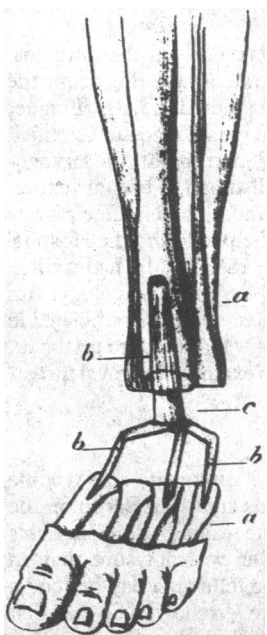


FIG 3—This ankle may well have been part of the "skeleton of Paris," now lost

physiology. Gluck had attempted after years of experimental work to restore the form and function of chronically diseased joints. Although these attempts failed, they represent the work of a pioneer whose diverse and original research deserves recognition.

We thank the department of medical photography, Derriford Hospital, Plymouth; Dr H Bunn for help with translation; and Ms H Frame for typing the manuscript.

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## Doctors differ over the German crown prince

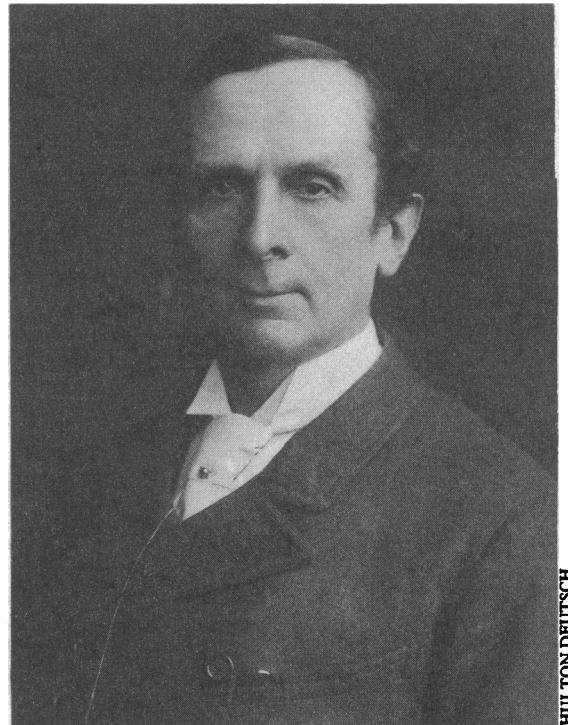
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"The doctors determined to make him unconscious, and to carry out the removal of the larynx without having informed him of their intention. I raised objections, and required that they should not proceed without his consent. . . . His father, after being informed by me, forbade them to carry out the operation without the consent of his son."<sup>1</sup> The objections to the proposed treatment were raised by Otto von Bismark, the chancellor of Germany, and the throat the doctors proposed to cut was that of the 56 year old German crown prince and future Emperor, Frederick William of Hohenzollern.

### Simply a cold

In January 1887 Frederick became hoarse and had considerable difficulty in clearing his throat. It was thought at first that he simply had a cold, but when the symptoms persisted his physician, Surgeon-General Wegner, asked Dr Gerhardt, professor of medicine in Berlin, to examine him. On 6 March Dr Gerhardt diagnosed a small growth on the left vocal cord but was unable to say whether or not it was malignant. He attempted to remove the growth surgically—first with a snare and then a ring knife. Failing in this, he simply cauterised the growth with the galvano-cautery and advised Frederick to go to Ems on the north German coast to recover. From there, in April 1887, Frederick's wife, Vicky, wrote to her mother, Queen Victoria: "All the irritation, swelling and redness is fast subsiding, he never coughs, and has not the feeling of soreness, but part of the little 'granula' which Professor Gerhardt could not take off with the hot wire, because the throat was too much irritated is still on the surface of one of the *Stimmbänder* and will have to be removed when we go home, then I think that the hoarseness will quite disappear."<sup>2</sup>

On their return to Berlin in May Gebhardt found that the growth was larger and the voice hoarser than ever. A surgeon, Professor Ernst von Bergmann, gave his opinion that the growth should be removed by thyrotomy—that is, splitting the larynx and removing the growth. Vicky wrote again to her mother: "The idea of a knife touching his dear throat is terrible to me. Of course Fritz is as yet not to know a word about this."<sup>2</sup> This plan was too much even for Bismark, who disliked the liberal anglophilic Fritz and found his interference in politics and state affairs irksome. But the thought of the doctors rendering the crown prince unconscious without his permission was anathema to the chancellor. He intervened and another consultation was held. Professor Tobold, a senior Berlin laryngologist, and five other doctors gave their opinion that the prince had cancer and that the surgical operation proposed by Bergmann should be undertaken. It was not. Yet another opinion was sought.



HULTON DEUTSCH

Morrell Mackenzie (1837-92), one of the foremost laryngologists of his day, was summoned to Berlin to examine the throat of the crown prince, Frederick William of Hohenzollern

Dr Morell Mackenzie was one of the foremost laryngologists of his day. After graduating from the London Hospital College, he studied in Paris, Prague, and Vienna and in 1859 learnt from Professor Czermak the use of a recently invented instrument, the laryngoscope.<sup>3</sup> He was the first Englishman to become expert in operations on the larynx and he had a huge private practice in London. He had helped found the Hospital for Diseases of the Throat in 1863 and he had written several books and articles on otolaryngology; his *Manual of Diseases of the Throat and Nose* published in two volumes in 1880 and 1884 was a standard textbook. Mackenzie was summoned to examine the royal throat.

### No operation necessary

Morell Mackenzie was no diplomat, and trouble wasn't long in coming. On his arrival in Berlin on the evening of 20 May 1887 he examined Frederick's throat and announced that he was not sure that an operation was necessary. The following day he took a biopsy specimen and sent it to Virchow, who said that the specimen was inadequate but that there was no malignancy in the small piece he had examined. The German doctors maintained that the clinical behaviour

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BMJ 1992;305:1536-8