

'Dr Steinach coming to make old young!': sex glands, vasectomy and the quest for rejuvenation in the roaring twenties

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In the 1920s, research on the endocrine glands – especially the sex glands – was widely expected to lead to revolutionary new ways of improving human life. The medical marketplace was crowded with glandular techniques to revitalize the aged. 'Monkey glands' apart, the Austrian physiologist Eugen Steinach's simple, vasectomy-like operation was perhaps the most popular of these. Steinach was one of the leading endocrine researchers of the early 20th century and the Steinach Operation was based on rigorous laboratory research. It was much more than a simple scientific error, and its history shows us how early endocrine research was shaped by broader social and cultural forces.

At the age of 69, the poet William Butler Yeats (Fig. 1a) underwent an operation called the Steinach Operation, which was essentially a vasectomy, but promised physical and mental rejuvenation. 'It revived my creative power,' wrote Yeats in 1937. 'It revived also sexual desire; and that in all likelihood will last me until I die.' It was not just his concupiscence that was stimulated by the operation, but also his art, resulting in a crop of late poems ranked with his best work [1]. For women, irradiation of the ovaries was considered equivalent to this operation; after submitting to it, the 66-year-old American novelist Gertrude Atherton (Fig. 1b) claimed to feel 30 years younger. Her 1923 novel *Black Oxen* was based on this experience and it became the greatest success of her career [2]. The 67-year-old Sigmund Freud had the vasectomy, hoping that it might delay the return of his recurrent oral cancer [3]. Numerous less famous people also availed of the operation in the belief that it would rejuvenate them physically, mentally and sexually.

The very history of modern endocrinology, one could argue, began with rejuvenation. In 1889, the 72-year-old physiologist Charles-Edouard Brown-Séquard had reported that he had alleviated his increasing frailty by submitting to subcutaneous injections of an aqueous testicular extract from dogs and guinea-pigs. The report was greeted with much scepticism and not a little jeering

in the popular and medical press, but so-called organo-therapy with extracts of every conceivable tissue became a fin-de-siècle panacea for virtually every conceivable disorder [4]. It also stimulated a great deal of serious experimental research on glandular functions. By the end of the First World War, all this research had reached a critical mass. The ductless glands and their still mysterious secretions came to acquire an air of omnipotence in the 1920s. 'We know definitely now,' announced a popular medical work of the 1920s, 'that the abnormal functioning of these ductless glands may change a saint into a satyr; a beauty into a hag; a giant into a pitiful travesty of a human being; a hero into a coward, and an optimist into a misanthrope.' [5]. At the heart of the gland craze was rejuvenation, with an ever-proliferating array of medical procedures promising the elderly what Yeats called 'a strange second puberty'. Perhaps the most notorious of these was the French–Russian surgeon Serge Voronoff's implantation of ape testicles ('monkey-glands') into aging men (Fig. 2) [6]. Equally prominent, although less overtly sensational, was the Steinach Operation. Who, then, was Steinach and what can the history of his operation tell us today?



Fig. 1. Rejuvenation and celebrity. (a) William Butler Yeats, photographed by Howard Coster in 1935, when Yeats was 70 years old. Reproduced, with permission, from the National Portrait Gallery, London, UK. (b) Gertrude Atherton.

Although largely forgotten today, Eugen Steinach, director of the Physiological Section of the Institute of Experimental Biology in Vienna (Fig. 3), was at the forefront of endocrine research in the 1920s. He was nominated for the Nobel Prize in Physiology six times between 1921 and 1938, although he never received it. Contemporary textbooks and medical journals devoted many pages to his experiments on the sex glands and newspapers were full of gossip accounts of Steinach operations performed on aging millionaires [7]. When Steinach planned (unsuccessfully) to visit America, the *New York Times* expressed the widespread fascination in a memorable headline: 'Dr Steinach Coming to Make Old Young'. His very name became a verb – people did not simply have the Steinach operation, they were 'Steinached' [8]. These controversial clinical interventions were rooted in his innovative experiments on sexual development (Box 1).

These innovative studies established that male or female development depended almost entirely on the sex glands and their internal secretions [9]. All of this showed, as Steinach put it, that sex, in spite of being *determined* by genetic factors, could always be modified in its *characteristics* by manipulating the sex glands [10]. This dream of controlling sexual characteristics and behaviour drew Steinach out of the laboratory into the clinic. He was convinced that human homosexuality was due to the incomplete differentiation of the gonads, reasoning that the male homosexual probably possessed testicles secreting feminizing substances. So he introduced a 'treatment' for homosexual men in which one testicle was removed and replaced with a testicle from a heterosexual donor [11].

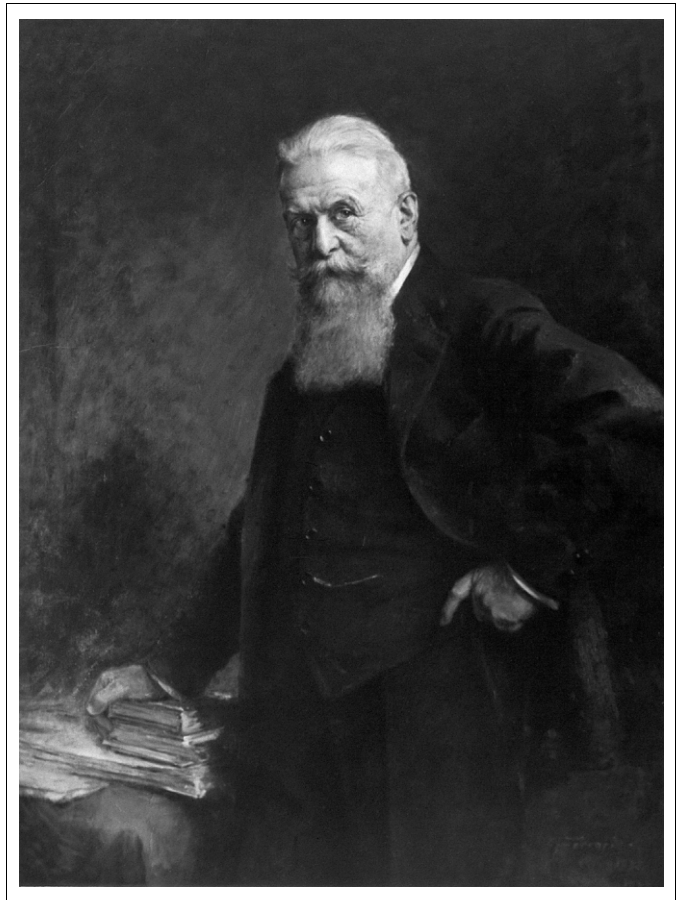


Fig. 3. Eugen Steinach. Reproduced, with permission, from the Wellcome Library, London.

Hardly surprisingly, it proved ineffective, but clearly demonstrates the narrow biologicistic principles with which Steinach sought to intervene in the complex world of human sexuality.

The same impetuosity characterized Steinach's approach to rejuvenation. Again, it all began with rats – rats castrated before puberty grew up sexually undeveloped, whilst untampered animals regressed to a near-infantile sexual state in old age. Humans weren't necessarily any different. Sexual differences were blurred in children and the elderly, and for Steinach, senility was a desexing process. The senile were functionally analogous to pre-pubertal castrates: both lacked adequately functioning sex-glands [12]. However, because prepubertal castrates developed normally once they had been given healthy gonadal implants, would the senile regain the biological characteristics of youth if their sex glands could somehow be revitalised?

Vasectomy was known to destroy the sperm-producing cells of the testicle and that, Steinach reasoned, might induce the proliferation of the separate hormone-secreting cells. He, therefore, attempted to rejuvenate senile male rats by bilateral vasectomy. Within a few weeks of the operation, he reported, the previously lethargic, underweight and almost lifeless rats had become active, gained weight, developed a glossy new fur and regained sexual interest. Some hitherto decrepit animals were now tireless sexual performers, having intercourse as many as 19 times

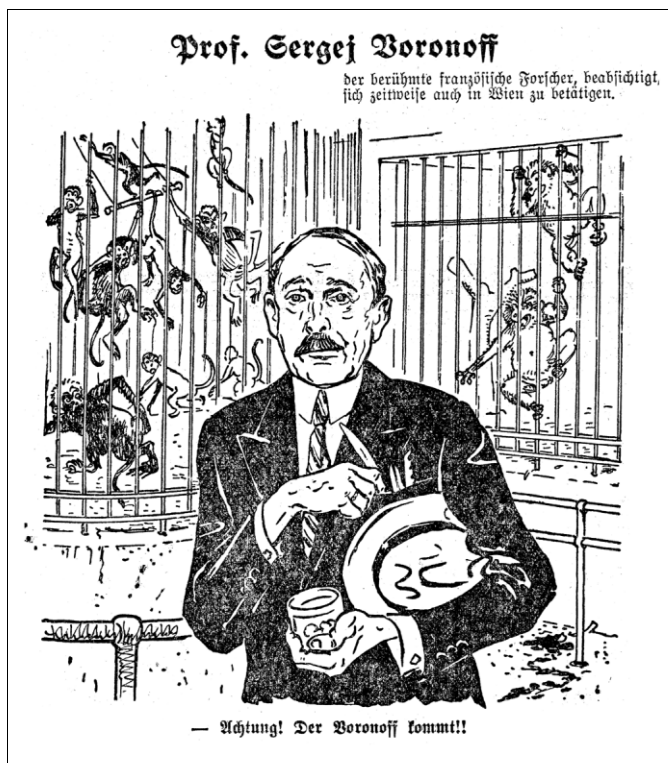


Fig. 2. Caricature of monkey-gland surgeon Serge Voronoff, probably from 1936. Reproduced, with permission, from the Wellcome Library, London.

Box 1. Steinach's experimental research

Behind Steinach's sensational image lay more than two decades of sophisticated laboratory investigation of sex gland function. In his first two series of experiments on rats, reported in 1894 and 1910, Steinach established that somatic and behavioral sexual maturity was induced by chemical substances from the sex glands. Was the internal secretory activity of the testis linked with the sperm-producing function of the gland or were they two autonomous functions? Approvingly citing the previous investigations of Pol Bouin and Paul AnceI of Strasbourg, Steinach asserted that the microscopic examination of sexually active testicular grafts revealed that not a single generative cell had survived in the grafts. The interstitial cells (or Leydig cells) had not only been spared, however, but they had proliferated beyond their usual numbers. Always fond of coining colorful but not strictly accurate terms, Steinach christened the interstitial cells collectively as the 'Puberty-Gland' (Pubertätsdrüse). The term, as well as the hypothesis, generated great controversy at the time, although the hypothesis eventually came to be accepted. (The operation for rejuvenation would, of course, be founded in this distinction.)

Many aspects of puberty-gland function remained unclear. Were the effects of the puberty-gland sex-specific? Would, for instance, the transplantation of an ovary be as effective as a testicular graft in masculinizing a castrated male? In order to answer this question definitively, he grafted ovaries in male rats castrated in infancy. The male sexual characters of his grafted castrates were severely stunted, and the sexual characters that normally remained 'indifferent' in males, such as breasts and nipples, underwent remarkable growth, leading even to lactation. In the partly successful cases, where the ovarian grafts had been resorbed but only after a variably viable period, the nipples had enlarged during the period the graft was viable and then, when the graft had perished, they regressed a little, but not back to the male status. These nipples remained at an indeterminate stage between male and female. The anatomical and physiological characteristics of masculinity and femininity, then, were produced by sex-specific secretions produced by the interstitial cells. Steinach, characteristically, was not concerned solely with the somatic sexual characters but also with sexual behavior. When his 'feminized' animals reached puberty, they did not display characteristically male mating behavior and showed no interest in females in heat. Instead, they behaved exactly like females, showing the characteristic defense-reflex of females: the raising of a hind foot and sharp backward strike to prevent being clasped by an unwelcome male. Intriguingly, these feminized males were often more feminine in certain ways than average females of their kind (Fig. 1). The

feminized male, for instance, was even smaller in stature than the usual female, and 'his' breasts were comparable to the breasts of a pregnant female, rather than a young female of 'his' age. The feminized males even lactated; infants of the species recognized them as females and followed them around for milk. The experimental animals obliged by suckling them in what Steinach considered to be the typically feminine way. For Steinach, lactation and maternal care of the young constituted the highest expression of femininity. In 'masculinized' females – females whose ovaries had been removed in infancy and replaced with testicular grafts – the nipples, mammary glands, and uterus remained uninfluenced. The 'indifferent' characters such as build and fur were transformed however, to typically masculine forms. The sexual behavior was masculine: the experimental animals pursued females in heat, fought with other males over possession of females, and clasped them in the typically male way.

What remained to be determined were the possibility and consequences of dual transplantation of ovaries and testes in the same individual. Could such a transplantation succeed? And if it did, would it turn the recipient into a hermaphrodite? Unfortunately, it was difficult to ensure the prolonged survival of both grafts in castrated animals, but the few successful cases fulfilled Steinach's expectations. These animals, when fully grown, had male build and appearance but the nipples, areolae, and the mammary tissue had become fully feminized. As soon as the ovarian graft was removed, the breasts returned to the usual male condition and the animal developed in a generally masculine manner. The removal of the testicular graft, on the other hand, led to feminine development. The sexual behavior of the experimental hermaphrodites was cyclically masculine and feminine. The same animal that had once been attacked by other males later became an object of sexual interest to the latter. This feminine phase was accompanied by lactation and the two features always returned together at intervals of two to three months.

These experiments, according to Steinach, proved that organisms developed into male or female not because of some inborn, pre-determined programme but because of glandular stimuli. Although he conceded that sex might be *determined* by genetic factors, the *characteristics* of sex could always be modified by modulating the functions of the sex glands. His attempts to 'cure' homosexuality or to reactivate the elderly were guided by this experimentalist perspective; those clinical efforts failed, in a sense, because that perspective could never accommodate the complexities of human sexual physiology and behaviour.



Fig. 1. Guinea-pigs from Steinach's series of feminization experiments. From left to right, normal brother, feminized brother, normal sister and castrated brother. Reproduced, with permission, from the Wellcome Library, London.

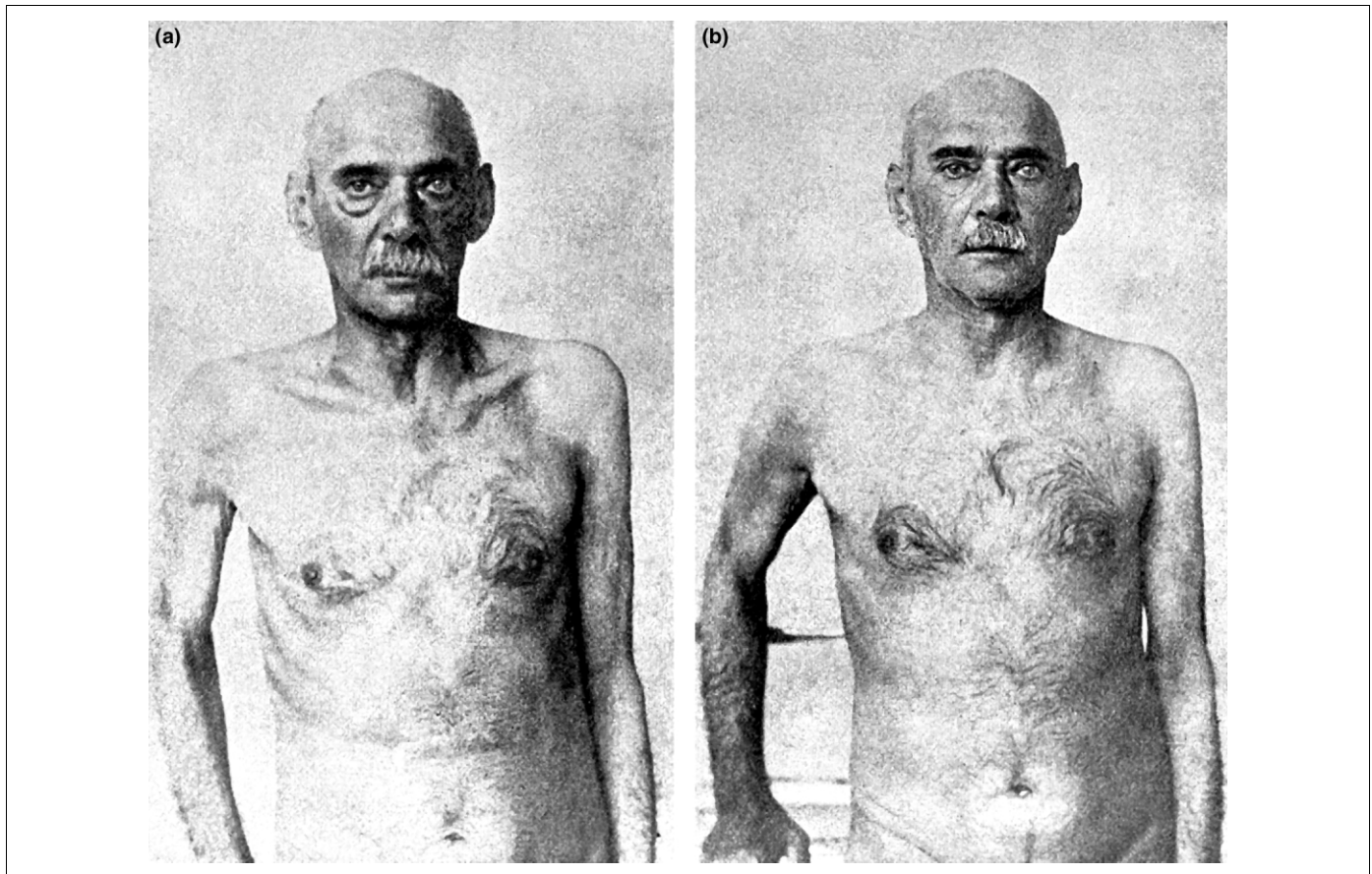


Fig. 4. Seventy-year old man (a) before and (b) two months after the Steinach Operation. Reproduced, with permission, from the Wellcome Library, London.

in 15 minutes. Emboldened by these findings, Steinach had three human subjects vasectomized without their knowledge during surgery for other purposes. The very first patient was a coachman, only 44 years of age, but presenting 'a typical picture of premature senility without organic disease'. He had lately been unable to work for long hours and had lost weight and appetite. His skin was dull, his hair grey and scanty, and his muscles weak. There were no dramatic consequences for the first three months but then, his appetite increased, he gained weight and his appearance became hale and hearty. Eighteen months after the operation, the patient looked like 'a youthful man at the height of his vitality' (Fig. 4) [13].

Soon, reports of similar cases of successful rejuvenation by the Steinach Operation were pouring in from all over the world – Vienna, New York, London, St Petersburg, Copenhagen, Chile, Cuba and India [14]. Not every instance of rejuvenation was successful, but the operation was so simple that fatalities were exceedingly rare and the sensation-hungry media obligingly inflated every positive claim into a miracle [15]. Rejuvenation was not just for men. Even though females had no vas deferens to ligate, the germinal cells of the ovary could be destroyed by low-dose radiation. Although the use of X-rays, even then, was seen as potentially dangerous, this treatment did attain some popularity [16]. Its effects, as Gertrude Atherton testified, could be as dramatic as the results of the vasectomy in men. Some time after her own treatment, she 'had the abrupt sensation of a black cloud lifting from

my brain, hovering for a moment, rolling away. Torpor vanished. My brain seemed sparkling with light' [17].

The medical press of the time was full of well-informed and spirited debates on Steinach's work, especially the operation for men. These discussions were uniformly respectful, but rarely uncritical or adulatory. One frequent and obvious charge was that the Steinach operation produced its effects solely by suggestion. The champions of the operation replied that identical results had been repeatedly produced in patients 'Steinached' without their knowledge in the course of another operation [18]. The reawakening of the libido in the elderly worried many, who feared that the Steinach operation, even if successful, merely led to the 'brief revival of sexual potency in elderly debauchees, who would soon afterwards end their days in an asylum' [19]. The biologist Paul Kammerer, a close colleague of Steinach's pointed out that even if the restoration of the libido was considered immoral or dangerous, 'rejuvenation, by restoring mental faculties together with the love and ability to work, endows life anew with high, ethical riches' [20]. 'Ability to work' is a key phrase in the history of rejuvenation research. In virtually all the case reports, 'inability to work' was one of the major complaints of the patient – especially in males – and 'enhanced energy and efficiency' were the earliest and most frequent improvements reported after the operation [21]. Rather than making old men young, the Steinach operation claimed to make aging people vigorous, energetic and productive. Not age but energy was the point at issue.

Steinach's vociferous supporter Peter Schmidt wrote a popular medical book entitled *Don't Be Tired!*, in which he described fatigue as a 'world-epidemic, beneath the burden of which the greater part of humanity is daily groaning more loudly'. That book culminated in a chapter on the Steinach method of rejuvenation, which asked, 'Why do you want to be tired? Because you are old? Yes, but then you need not be old!' [22]. In modern Europe, religious exhortations against sloth had been succeeded by new, scientific ways of combating fatigue and enhancing productivity – the Steinach Operation was the latest and the best of them [23].

The revitalization of individuals was not merely a medical task but the key to reviving a tired civilization and redeeming humanity, especially after the First World War, which had robbed Central Europe of a large part of its young male population. In America, the German sympathizer George Viereck argued that the Steinach operation could help Germany recover speedily from its post-war economic destitution by making its older population more productive [24]. Gertrude Atherton called upon Germany to use the Steinach operation to create a new breed of superman-leaders that could restore the nation's lost glory [25]. After the Great War, 'biology,' says historian Paul Weindling, offered 'creeds of national regeneration, combining the scientific with resonating categories of nature, life and the race' [26]. The Steinach Operation was but one illustration of that trend.

Changes in the relationship of biology and society were matched by changes in concepts of aging itself. 'We are now able,' proclaimed Peter Schmidt, 'to regard old age as an illness, as a result of decay in the reproductive gland' [27]. Aging and fatigue were caused by biological deficiencies: replenish those deficiencies with a fairly simple procedure and one would soon possess a rejuvenated body surging with the energy of youth. The story of the Steinach Operation, in short, is much more than an instructive episode in the forgotten history of early endocrinology. It is part and parcel of the cultural history of the early 20th century. As Spengler and his epigones lamented the decline of the West, biologists dreamt of building a new world, a new species, and a new, clearly sexed, un-fatigable body. The significance of the Steinach operation within that utopian project far transcended its actual clinical efficacy. Paul Kammerer's lyrical invocation of its future potential summed it all up: 'Man, who has subjected iron and stone to the power of his indomitable will, will at last become master of his own house ... just as one can rule others only after mastering one's own will, so man, after he has acquired sovereignty over his own body, will achieve a heretofore unimagined new freedom to shape the future of mankind and attain true civilization' [28].

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