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## Rudolf Virchow (1821–1902)

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**Abstract** Rudolf Virchow died 100 years ago. The author summarizes the multifaceted personality of this man who so profoundly influenced the shaping of contemporary surgical and experimental pathology and played an important role in designing the social structure of modern Germany. Goethe's influence in the development of 19th century morphology is also suggested.

**Keywords** Surgical pathology · History · Virchow · Goethe · Morphology

### Introduction: Goethe and morphology

Goethe was considered to be the founder of the term and the concept of morphology. Moreover, he perfectly understood that morphology was the only reliable tool available to interpret nature [3, 8, 9].

Virchow made a very similar statement at the start of his career [12]. As a young physician in Berlin, he perceived the poor quality of contemporary medicine. Clinical diagnostics in a modern sense was still shrouded in the mists of fiery controversies, and a consistent therapeutic practice was confined to a sort of dreamland. Therefore, the young Virchow stated that the only tool available to cross the quagmire of contemporary medicine consisted of morphology. Virchow wrote about Goethe's work concerning morphology (Goethe als Naturforscher und in besonderer Beziehung auf Schiller, 1861) [12]. Moreover, the influence Goethe played on prominent histologists such as Jan Purkinje [5] makes for sure that Virchow's early experience was triggered by that titanic polymath.

### The young Virchow: history, morphology and social commitment

Both Virchow's birthplace and family profoundly contributed to his mental shaping. He was born in 1821 in Schivelbein (Pommern), now Swidwin, a town now belonging to northern Poland. His parents inspired to him a profound love for nature and a deep sense of moral responsibility. Such an attitude to responsibility was the legacy of Martin Luther's moral teaching. The great achievements of modern Germany relied on the deep sense of moral responsibility of individuals to the community to which they belonged. Virchow was constantly committed to medical and social community. A philanthropic attitude is not quite rare in physicians. Virchow's exceptionality consisted of his belief that medical practice and political struggle were inseparable entities.

The fascination of Pommern's landscape, the trips to Rügen island to see the migration of cranes, left a constant imprinting in Virchow's soul: a burning desire to explore, to unravel, to scan meticulously every aspect of life.

The presence of Polish people in Pommern was also critical for Virchow's early experience. His ethnic ancestry is controversial. Doubtless, Virchow admired Slavic lore and culture profoundly, and also respected Polish people. Such an attitude was probably one of the primers for his political commitment.

His interest in history was also of major importance for his educational development. When Virchow started studying medicine in Berlin, he was particularly annoyed by the backwardness of the programs and of medical culture [12]. He was also an aggressive critic of the clumsy degree theses in Latin. Nevertheless, the presence of history in the medical core curriculum, was a decisive item for Virchow's cultural development because he was invited to write a history of his birthplace by his mentors (Zur Geschichte von Schivelbein, 1847) [12]. That was his first original work. Moreover, it elicited his interest in social themes. Once graduated, Virchow showed how morphology could be a fundamental tool in medicine by

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performing autopsy in strict relation to his clinical practice.

His early great successes in demonstrating the etio-pathogenesis of pulmonary embolism through an innovative application of experimental medicine to medical practice are well known. The same is for his early implementation of microscopy in pathology. The rapid emerging of the concept of cellular pathology was tarnished by the bitter and unfair competition with Robert Remak, the true inventor of cellular pathology and of the modern doctrine of neoplasia. Hans Peter Schmiedebach gathered a thorough documentation on that embarrassing episode [11].

Usually less appreciated is the attitude to the use of communication media present in Virchow's medical practice and research, clearly expressed by the foundation of the journal entitled *Archiv für pathologische Anatomie und Physiologie und für klinische Medizin: the Virchow's Archiv*.

Virchow was not yet 27 years old and had already evoked a stirring of curiosity in Europe. He knew a number of foreign languages – English, French, Italian, Greek, Latin – and a number of Slavish idioms and sentences. Therefore, he was quite able to communicate. He was also very aggressive. Carl Rokitansky was probably the first victim of Virchow's piercing criticism, because of his scarce interest for clinical correlations and microscopy.

1838 represented a milestone in Virchow's life. On behalf of the Prussian government, he performed a vast survey in Silesia to discover the causes of an epidemic (probably typhoid fever) afflicting that region. In his report, Virchow attributed the causes of the epidemic to the massive economic crisis encroaching northern Germany (cause of the emigration to Northern America in the first half of the 19th century). On that occasion, Virchow also exhibited his idiosyncrasy for infectious disease, the cause of his persistent hostility to Robert Koch in the years to follow [10].

While the Prussian government did not care for the report, Virchow achieved his political ripeness: he had become a radical, and when the revolution erupted in 1848, he was actively involved in Berlin's barricades attending the wounded at the Charité. Moreover, he had the bitter experience to fight against the royal Pommern regiment of Stettin at the barricade of Friedrichstrasse.

Virchow's rebel attitude caused a lot of trouble in his relatives, who supposed him to be a communist. Marx and Engels were just issuing their Manifesto. He justified himself with his father by writing that he wasn't [12]. Nevertheless, he was punished by the Prussian rulers and his activity at the Charité was severely limited.

In 1850, Virchow was invited to Würzburg (Bavaria) as a full professor. That was not just an exile. Albert Kölliker admired him sincerely and contributed to his nomination there. The period spent in Würzburg represented for Virchow an authentic triumph. Despite his cold and monotonous style, numerous fascinated students attended his lectures because he presented and dis-

cussed factual realities consistently and with stringent logic.

Virchow's coldness did not imply that he was unconcerned with teaching. The easiest demonstration of this is provided by his major works. They all show the typical structure of oral lectures, from which they probably originated.

The short period Virchow spent in Würzburg (1850–1856) represented the consolidation of his academic success and the start-up of a happy family life. Virchow married in 1850 to an adolescent girl (Rose Mayer), the daughter of a colleague, a professor of Obstetrics in Berlin. Rose begot him six children and presented to him an apparently quiet and serene family life.

The Bavarian government entrusted Virchow an enquiry on the health state in the Spessart. In his reports, Virchow expressed his disgust for the horrifying condition of life of the people, starving in dirty huts. Such a situation was commonplace in vast areas of Europe, and would be the primer of the social unrest of the 19th century and of the birth of the socialist movement. Nevertheless, Virchow perceived how backward the German states were with respect to England and France, despite the immense potentialities he envisaged in his country.

After the incendiary experience of 1848, he realized that a keener approach to political life was needed. The resurrected medicine had obtained the tools necessary to transform social reality in a positive sense, and Virchow established that an all-out commitment was needed. Just as in Italy, the unity of Germany was profoundly desired in progressive intellectual circles and was considered to be a fundamental condition to create a modern nation. The German federation with its parliament in Frankfurt am Main should have been the ideal prologue to a gradual and pacific unification of that huge country. However, a lethal enemy was rapidly recognized: the Prussian kingdom with its ruthless dynastic desire of hegemony. The parallel with Italy is still impressive: in both countries the unification was obtained via a dynastic war of conquest. The monarchs of the two young nations were never able to create a genuine consensus, and played an important role in generating the persistent unrest and the tragic common outcome we all know.

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### Berlin: the climax

In 1856, Virchow was back in Berlin as full Professor of Anatomic Pathology and Physiology. His book *Die Cellular-Pathologie* was issued in 1858. Contemporarily, Virchow's political career was started with his nomination for the Council of Berlin. More significantly, he was among the founders of the German Party of progress (1861) and was admitted to the Prussian Parliament in 1862, just while Bismarck obtained the nomination for Prussian Prime Minister by King Wilhelm I: the clouds of a stormy political struggle were gathering.

The open-mindedness of Virchow was in sharp contrast with the profoundly anti-parliamentary feelings of Bismarck and of the King. Moreover, Bismarck wanted to obtain the financial support of a massive campaign for armaments as a prelude to the conquest of the supremacy of Prussia in Germany and in Europe, at variance with Virchow's request of social reforms. The aggressive opposition by Virchow and his party was a nuisance to Bismarck, who tried to circumvent the Parliament. A compromise between Virchow and Bismarck was practically impossible, because they represented two completely opposite ways to interpret politics. Bismarck saw in Virchow the incarnation of parliamentary democracy and an adversary able to gather a systematic opposition to his projects of military expansion. Therefore, his challenging Virchow to duel in 1865, although Bismarck had been publicly accused to be a liar, might rather appear as a cold plan to get rid of a man unable to trade with weapons than a reaction to a scorching offense. Many friends of Virchow thought like that. Fortunately, Virchow was not so crazy to accept the challenge [1, 12].

Despite the hostility of Bismarck, Virchow was able to obtain a major success: to transform Berlin in a splendid metropolis. That great city was very dirty, because the public sewers did not yet exist. Therefore, Virchow started studying the problem accurately, and, on invitation by Napoleon III, he visited the famous sewers of Paris in 1867. The ensuing project he submitted to the Berlin municipality was amply modified. Nevertheless, the city obtained its sewers (1873) and very soon assumed the solemn and elegant shape characteristic of the years before 1945 [6, 12].

Berlin is very close to the heart of Germans. It is very difficult to understand why Americans were convinced (apart from Kennedy) that it was a city of secondary importance and unworthy to struggle so much for apart from some hot episodes of the cold war. A meaningful witness of Virchow's affection to Berlin consists in his enthusiastic support to the creation and expansion of museums and art collections. In this field, the most prominent merit of Virchow consists of convincing Heinrich Schliemann to present to Berlin's museum a number of his archeological findings [12].

Schliemann had not been adequately appreciated for his merits in Germany; therefore, the splendid items from his archeological campaigns poured into the British Museum. Virchow met Schliemann in 1874, in coincidence with an impressive increase of Virchow's studies in old Germany and Poland. A profound interest in natural history, geology and folklore, ethnic peculiarities had always been a characteristic of Virchow's ordinary life. His travels, whatever the scope, had always some collateral 'adventures' in natural history, anthropology or geology, often involving Virchow's children. His interest in palaeo-anthropology, despite the famous blunder in interpreting the first finding of a Neanderthal man [7], permits to consider Virchow to be the first genuine palaeopathologist because of his skills in accurately dating with stratigraphy the corpses he studied and in corre-

lating such findings with historic and folklore records. The friendship with Schliemann permitted to sharpen Virchow's palaeopathological skills during his visits to Troy and to the Nile valley (1888).

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### Controversial items

While Virchow was visiting the Nile valley, Kaiser Friedrich III was dying, just after 3 months of rule. That death was considered to be a massive disgrace for Germany and Europe, because Friedrich, despite being a military hero (wars against Austria and France), appeared to be a wise and open-minded man, profoundly hostile to the aggressive and reactionary designs of Bismarck. Of course, there is no proof that Friedrich might have been able to avoid the increasing aggressive attitude of Germany and the first world war. However, Wilhelm II, his successor, was a very immature ruler, who immediately fired Bismarck and replaced him with a series of mediocre ministers, unable to counter him. Max Weber said that Wilhelm's Germany, the most advanced and civil nation in the world, appeared to be ruled by a patrol of crazy men. Many people gave Virchow the blame for that because he was wrong in diagnosing the laryngeal cancer of Friedrich III. A series of laryngeal biopsies were submitted to Virchow. He always diagnosed a benign process despite the progressive worsening of symptoms. The biopsy specimens have been reviewed and modern pathologists are convinced that Virchow had acquired sufficient knowledge and experience to identify that cancer correctly. While many modern pathologists stigmatized the error severely and judged it the first known example of malpractice in pathology, because the samples available were sufficient to formulate a correct diagnosis, recent studies appear to be more liable to absolve Virchow [2]. Virchow's contemporaries were not so severe and would specifically blame Virchow's lack of concern for the health of Friedrich III, a close friend to him. While the emperor was dying, Virchow was engaged in a ceaseless strolling in Egypt, Near East and Italy in search of anthropological and palaeopathologic findings [12]. Nevertheless, once back in Berlin, Virchow obtained the pardon of the imperial family.

Before examining other facets of the complex and fascinating personality of Virchow, it is appropriate to consider the intensive criticism this man is constantly undergoing. His misinterpretation of the Neanderthal skull as a modern case of microcephaly was discussed above. Of course, that was a blunder, although Virchow had correctly dated the geological layer where the skull had been found [12]. However, in other circumstances, Virchow produced interesting results as an antiquarian. Nevertheless, his influence on anthropology is considered a very pernicious one.

The dispute with Robert Koch about tuberculin as an effective therapeutic agent in tuberculosis has some very deep roots [10]. Virchow did not like Koch's studies in

infectious disease, because he did not immediately realize the importance of microorganisms in disease. Nevertheless, he was correct in criticizing the overestimated positive results obtained by Koch in his attempts to cure tuberculosis by tuberculin therapy. Autopsy demonstrated that the patients had died of active tuberculosis, despite the treatment with tuberculin. Nevertheless, Virchow is still represented as the villain in children's tales.

Such a judgment is probably severe. Virchow's ineptitude to understand Koch's and Cohnheim's discoveries appears to be a major cultural setback, however. Koch's discoveries were constantly considered with cold skepticism. Julius Cohnheim was probably the most prominent disciple of Virchow. Nevertheless, he never accepted the consistency of Cohnheim's splendid studies on acute inflammation and diapedesis. Because of the massive prestige Virchow enjoyed in medicine, such prejudices appeared to be very dangerous.

Another topic justifying some criticism to Virchow was his involvement in the Kulturkampf, the strife against the Catholic Church to limit its hegemony in Germany. Virchow himself apparently coined the term Kulturkampf (1873). During that unsuccessful struggle, he was aligned with Bismarck for the first and last time. On that occasion, Virchow did not appear like a fanatical anti-religious man. His point of view expressed the classic attitude of Lutherans and of democrats, their modern counterpart: a profound desire of independence of thought in every field of human life. Unfortunately, the struggle of Virchow and Bismarck was destined to failure. The last lethal blow to that project came from Hitler in 1933, with the signature of the concordat.

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## Death. Virchow in our mind

25 January 1902: Virchow, in perfect health, fell along a tramway road and had a femur badly fractured. He never did recover completely until he died on 5 September [12].

Virchow was a good man, animated by sincere affection to mankind. We have already seen his intensive commitment to the poor condition of Poles, his aggressive parliamentary struggle against Bismarck and the conservative faction. During the war against France, Virchow organized a hospital train. After that war, he tried intensively to mitigate the bitter animosity of the French scientists against their German colleagues.

Therefore, in many circumstances, Virchow appears to be an honest democrat acting in perfect accord with his concept of medicine as a social and political practice. His struggle against Bismarck could neither avoid the wars nor the frightening adventure where Germans had been propelled by a myopic political establishment. Nevertheless, the commitment of Virchow and his democratic partners was effective in stimulating the social changes making Germany the most advanced country in social organization.

Virchow did not evoke human sympathy and affection because of his coldness and aggressive behavior. That

was probably critical in producing a negative attitude in pathologists. In a famous inaugural speech issued in the *Verhandlungen der deutschen pathologischen Gesellschaft* in 1898, Virchow established a sort of supremacy of pathology and experimental medicine with respect to all other medical disciplines. That would create a sort of wall separating pathology from other medical disciplines and a series of difficulties never completely removed in the relationship between pathology and clinical practice. Nevertheless, I cannot blame Virchow for all that. His speech of 1898 expressed the pride of an old man celebrating a new successful discipline practically created by him and at the climax of its success.

In conclusion, the success of modern pathology in medicine was practically started at Virchow's return to Berlin (1856). Other Berlin luminaries, such as the surgeon Theodor Billroth (1829–1894), saw this resurrection of the pathological tradition as a way to inject both scientific culture and clinical utility into the medical milieu of Germany [4]. Billroth, in particular, concerned himself with placing surgery on solid scientific grounds, carefully tracking the work on the origins of tumor cells performed in the 1860s by Virchow and his successors. Billroth felt such work would be important in diagnosing and treating neoplastic disease. Indeed, it was in just that decade that pathological anatomy provided the tools by means of which inflammatory and malignant neoplasia could finally be differentiated. Thus, the ability of the surgeon was enhanced to distinguish between disease processes that, while appearing similar to gross inspection, actually bore critically dissimilar prognostic and management implications. Surgical pathology was born [4].

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