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Brian L. D. Coghlan
Leon P. Bignold

Virchow's Eulogies

Rudolf Virchow in Tribute to his Fellow Scientists

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Authors:

Brian L. D. Coghlan
12 Vansittart Place
Beaumont
SA 5066
Australia

Leon P. Bignold
University of Adelaide
Inst. Med & Vet Sci
Div. Tissue Pathology
POB 14, Rundle Mall
Adelaide, SA 5068
Australia

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Preface and Acknowledgements

This book presents translations of eulogies written by Rudolf Virchow (1821–1902) – the most remarkable medical man in nineteenth century Germany – concerning some of his famous teachers, pupils and colleagues. Virchow's achievements were unquestionably outstanding and contributed especially to the fields of medicine, politics, public health and anthropology.

To give some indication of Virchow's works – they are the subject of many books and articles many of which are listed in Appendix 2b of this book – the following highlights may be noted. After graduating in medicine in 1843 and gaining wide-ranging experience in academic pathology, Virchow published "Cellular Pathology" (1858), in which he elaborated the fundamental idea that disturbances in the cells in the body are the mechanisms by which pathological lesions form.

In addition, Virchow – while remaining primarily Professor of Pathology at the University of Berlin – founded and edited the pathology journal which bears his name; edited other serials, including the former Canstatt's Yearbooks; and maintained a clinical practice, in the form of responsibility for a ward at the Charité Hospital in Berlin. Virchow influenced many of those – his *Assistenten* – who came to train with him towards outstanding careers of their own.

Rudolf Virchow's second major area of activity was politics, in which his views were consistently liberal. He actively supported the Revolution of 1848 and for this was effectively banished from Prussia for the period 1850–1857. After his return to Berlin he was elected as a liberal to the City Council of Berlin in 1859 and the Prussian *Landtag* in 1861. Although his opposition to Bismarck's policies of illiberalism and militarism ultimately had little effect on the course of Prussian history, Virchow remained an important figure in Prussian politics until the end of his life.

In the field of public health: in the early 1860s Virchow discovered the life cycle of the parasite responsible for trichinosis and began a successful campaign for the measures necessary to eliminate this disease. Further, through his membership of the Berlin City Council, Virchow was important in implementing the construction of the city sewerage system.

In the fields of physical anthropology, paleontology and archaeology, Virchow founded a journal, was president of a relevant learned society and made many contributions to the scientific basis of these disciplines.

Because of the nature of the man and the importance of his contributions, as well as the distinction of the persons about whom he wrote, the present volume is not difficult to justify. Each eulogy is an historical document concerning the particular individual. All the works are accurate in detail – Virchow was "nothing if not precise" wrote Semon (see Appendix 1c) – and some of them also cast

light on events, in medical history as well as on European history generally, in the nineteenth century. Moreover, because the tributes were intended for a wide range of the academic and well-educated (*gebildet*) sections of German society, they often contain simpler and more concise explanations of Virchow's own views than are to be found elsewhere in his writings.

We have prepared an introduction which focuses on the major issues raised in the texts; in addition we have added notes to explain allusions and historical events which were well-known in Germany in Virchow's time, but may be obscure to some modern readers. At the end we include contemporaneous English-language material relating to Virchow at the time of his death, to stress how much he was appreciated throughout the world (Appendix 1). Finally, we supply bibliographies of Virchow's own works and works about him (Appendix 2).

In the main, the eulogies were identified in the bibliography prepared by Schwalbe (1901) (see Appendix 1a). However, neither the eulogy for Traube (chapter 6e) nor the address for Helmholtz (1892) are included in that bibliography and was found by the authors of the *Berlin. klin. Wochenschr*. The other exceptions are items on the Kaiserin Augusta, von Langenbeck and Schroeder. All these are listed in Schwalbe (1901) as being written by Virchow, but were found either to have been written by someone else, or the author's name was not given at all. These eulogies have not been included here. Virchow may have written additional eulogies for medical men of which we are unaware.

We are extremely grateful to our Editor (Dr Beatrice Menz) for continuous patience and support. Dr Han Baltussen translated the Latin passages and assisted with particular references. Professor Anthony Comin translated the Italian passages in chapter 5. Dr Axel Schmidt supplied us the meaning of a pharmaceutical term (chapter 3).

Dr. Mary Peterson gave outstanding assistance during all phases of the preparation of this book. We are also grateful to the staffs of the Barr-Smith Library, University of Adelaide, and of the Library of the Royal Adelaide Hospital and Institute of Medical and Veterinary Science in Adelaide. Elizabeth Goodwin typed all of the English articles re-published here; Mr Peter Dent of the Department of Photography at this Institute prepared many of the illustrations.

Individuals in Germany whom we must thank are Dr. Dorothee Boeckh, Heidelberg University Library; Dr. Sybille Mauthe, Heidelberg University Library; Fr. Cornelia Gräff, University of Würzburg Library; Fr. Helga Seifert Librarian and Dr. Bernhard Puppe, Institute of Pathology, University of Würzburg; Klaus Möschel, Administrator and Technical Director, Inter-Faculty Institute of Biochemie, University of Tübingen; Dr. Robert Diensberg, Archivist at the *Görres-Gymnasium,* Koblenz; Dr. Matthias David, *Campus Virchow-Kli-*

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Brian L. D. Coghlan
Leon P. Bignold

Adelaide, South Australia, April 2008

Translator's notes

Most nineteenth century German scientific authors of Manuals, Handbooks and Textbooks etc on specific subject areas wrote in simple styles, and their books were often translated and published in English: – for example by the Sydenham, later New Sydenham Societies in England, as well as by other publishers in the United States of America. However, when German authors attempted to invent 'Systems' and describe theories and mechanisms of biological processes – and especially when they attempted to apply philosophical concepts to biology and medicine – their writing styles tended to become complex, wordy, and difficult to render into good English. Good examples of translators who have mentioned these these difficulties are those of Rokitansky (1852), Henle (1853) and W. Roux (1888).

Virchow's style in these eulogies can be placed perhaps toward the easier end of this spectrum of difficulty. However, some of the usual Germanic nineteenth century stylistic habits – of long sentences, clauses-within-clauses, and failure to repeat the subject or verb in consecutive clauses – are relatively common. Further, eulogies by their nature demand some 'elevation' of style, and literary phrasing. Thus there are examples of complex flourishes of imagery which are not intelligible by literal translation into English. These have been rendered with corresponding English expressions.

To make other parts of the texts more easily readable, in the main, we have made only three additional types of changes. First, we have broken up sentences where a clear change of topic occurs. This is particularly where a change of topic in the original is indicated by a semi-colon. Second, the clauses-within-clauses have been marked off by dashes, and dashes in the original usually have been changed to the start of a new paragraph. Third, where a noun or verb applies to more than one clause, but is not present in the original, we have repeated the word.

Apart from these changes, we have limited ourselves mainly to changes of sequence (especially bringing verbs forward in sentences), together with occasional simplifications of expressions such as the removal of double negatives. Items in *Sperrdruck* have been rendered in Bold.

The German professorial titles: *Ordinarius* for full professor and Head of Institute, and *Extraordinarius* for adjunct or associate professor are used, because they have not exact counterparts in English. *Privatdocent* is rendered as 'lecturer' or 'private lecturer'. The German word *Assistent(en)* has been retained throughout, because there is no precise English word for the position which it implies – of a 'doctoral student and Professorial registrar / training Fellow' in the American or British systems. Also retained is the phrase *Dr habil.* which carries more specific significance as an academic credential in Germany

than does 'Ph D' currently in the English-speaking world. Similarly, *Geheimrat* is retained, because it was an honorary title which was not as important as its literal translation – 'Privy Councillor' – would suggest.

Chapter 1

Introduction

Rudolph Virchow (1821–1902) was a leading figure in the medical and political affairs of Germany in the second half of the nineteenth century. Born in Schivelbein (now Swindin, near Stettin and part of Poland, Figs 1.1, 1.2), he attended – from 1839 to 1843 – the *Friedrichs-Wilhelm Institut* (military medical school in Berlin) where he was taught by Johannes Müller (chapter 2) and Johan Lucas Schönlein (chapter 3). Müller had taught Theodor Schwann (chapter 6g), on whose work Virchow based much of his own early thinking on Cell Theory.

After graduation, Virchow (Fig 1.3) worked as a junior doctor at the Charité under Schönlein, but when not appointed an *Assistent* in Schönlein's clinic, Virchow became assistant to Froriep (1804–1861), the hospital Prosector (responsible for the post mortem examinations at the hospital). Under Froriep's guidance, Virchow began his phenomenal scientific output, and was appointed to succeed Froriep as Prosector at the Charité in 1846. At this time Virchow gave his first series of (very popular) lectures in pathological anatomy at the Charité.

At the same time, he joined the campaign in Germany to replace philosophy-dominated consideration of the natures of disease with a rational scientific approach. He was involved in the newly-formed Society for Scientific Medicine, and the Society for Obstetrics, both in Berlin. He was briefly associated with Reinhardt (chapter 6a) and Traube (chapter 6e) in the publication of the latter's *Beiträge* (1846–7) but it was with Reinhardt alone that Virchow founded (1847) the journal now known as Virchow's Archive. Throughout his lifetime the journal was published by the Reimer Company (chapter 6c, 6n).

In 1848 Virchow was briefly at the barricades during the revolution in Berlin, and also published a stridently-pro-revolutionary journal 'Medical Reform' (1848–9). In 1849 he married Rosalind (Fig 1.4), daughter of the obstetrician Carl Mayer (chapter 4). In 1850, because of his political activities, Virchow was dismissed from his post at the Charité and forced to leave Berlin. He accepted a Chair in Pathological Anatomy at Würzburg (Figs 1.5–1.9), where his *Assistenten* included Beckmann (chapter 6b), Friedreich (chapter 6f), and also Ernst Haeckel (see Haeckel, 1923). During his time in Würzburg, Virchow consolidated his ideas on the cellular basis of pathology (see Bignold et al, 2008).

Two years after his return to Berlin (Fig 1.10) in 1856, Virchow published his approach to his discipline as the "Cellular Pathology" (1858, Fig 1.11). In this book he argued for a system of pathology based on the abnormalities and responses of the cells at the site of the anatomic lesions of diseases (Bignold et al, 2008). He argued that if the types of cell in tissues are responsible for the

Figure 1.1. (above) Silhouettes of Virchow's father and mother. (From Rabl, 1907).

Figure 1.2. (below left) Virchow's birthplace in Schivelbein. (From Rabl, 1907).

Figure 1.3. (below right) Virchow as a young man. (From Rabl, 1907).

Figure 1.4. (left) Virchow and his wife about 1859.

Figure 1.5. (below) The Julius Hospital, Würzburg. By courtesy of the Bamberg State Library.

Figure 1.6. (bottom) Medical School,Würzburg. By courtesy of the Bamberg State Library.

Figure 1.7. (above) The Professors of Würzburg Medical Faculty in the early 1850s. (From Rabl, 1907).

Figure 1.8. (below left) The building for Anatomy and Pathological Anatomy, Julius Hospital, Würzburg (Photographed in 2007).

Figure 1.9. (below right) Virchow's desk while Professor in Würzburg. (Courtesy Fr. Helga Seifert, Institute of Pathology, University of Würzburg; photographed 2007).

Figure 1.10. (left) Institute of Pathological Anatomy (since demolished) in Berlin built in 1856 at Virchow's request. From Virchow's Archive, vol 235, 1921.

Figure 1.11. (below left) Title Page of Virchow's "Cellular Pathology", 1858.

Figure 1.12. (below right) Virchow in early middle age.

DIE

CELLULARPATHOLOGIE

in ihrer Begründung auf

physiologische und pathologische Gewebelehre.

Zwanzig Vorlesungen,

gehalten

während der Monate Februar, März und April 1858 im pathologischen Institute zu Berlin

von

RUDOLF VIRCHOW,

o. ö. Prof. der pathologischen Anatomie, der allgemeinen Pathologie u. Therapie an der Universität, Direktor des pathol. Institute u. ärztlichem Arzte a. d. Charité.

Mit 144 Holzschnitten.

BERLIN, 1858.

Verlag von August Hirschwald.

Figure 1.13. (above) Cartoon relating to the challenge to a duel which Bismarck issued to Virchow in 1863. The legend reads: "A Frankfurt newspaper thinks it knows the two duel-addicted persons who are being watched at every step in order to prevent them from killing each other. For the one, the patriot Behrends and for the other, the tavern-owner Schulze must answer with their heads". "Schultze" refers to Schulze-Delitzsch, a fellow-member of the Progress Party. "Behrends" was presumably the delegate in the Reichstag from Danzig who assisted Bismarck in his dealings with Russia in the crisis of 1863 (see Lord, 1923). The cartoon seems to mean that Behrends and Schulze would be guilty of the crime a abetting a duel, but there are numerous other possible ironic interpretations. The cowls may be a reference to the secret tribunals of vigilantes.

Figure 1.14. (below left) Berlin streets during construction of the sewerage system.

Figure 1.15. (below right) Virchow's study at the Institute. From Virchow's Archive, vol 235, 1921. Original held in the Stadtmuseum Berlin.

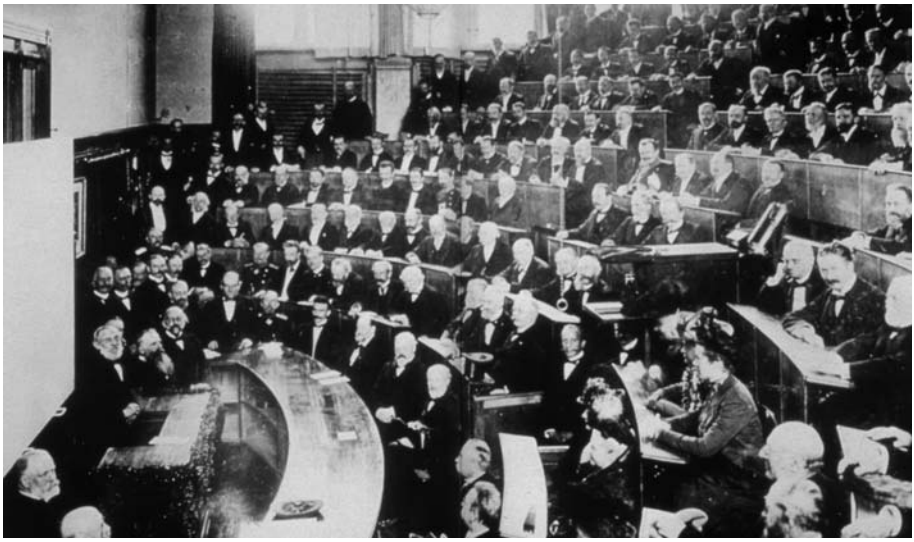

Figure 1.16. (above) Virchow at the *Festschrift* for his 70th birthday.

Figure 1.17. (below left) Virchow in old age.

Figure 1.18. (below right) Virchow's apartment building in Berlin. From Virchow's Archive, vol 235, 1921.

characteristics of those structures in the human body, then those types of cell in the lesions of diseases may account for the features of such lesions of those same diseases. This concept has come to be understood as fundamental to all pathology ever since and thus Virchow has become known as the 'Father of Pathology'.

In the early 1860s his medical works included studies of the life-cycle of the causative organism of trichinosis leading to effective prevention of the disease, and his work on tumours. His students in pathology at the time included Pagenstecher (chapter 6d) while Hoppe-Seyler (chapter 6m) worked on biochemical projects in his Institute.

In the same period, Virchow – then in his forties – entered the political arena of Prussia (Fig 1.12). In 1859 he was elected to the Berlin City Council and in December 1861 he was elected to the *Landtag* (Prussian House of Assembly) as part of a substantial liberal majority. The most important political period of Virchow's career followed. The liberals had won this election (December 1861) on the basis of their opposition to the King's proposed enlargement and modernization of the Army. In September 1862, after several months of deadlock with the *Landtag*, the King summoned Bismarck to the position of Minister-President (Prime Minister). Bismarck then governed without approval of the *Landtag* – i.e. illegally – by ignoring the provision in the constitution of 1850 that such approval was necessary for bills to become law. In 1863 Virchow's opposition to Bismarck's breaches of constitutional government was sufficiently persistent for the latter to challenge Virchow to an unaccepted duel (Fig 1.13). Virchow remained a member of the Berlin City Council, and made important contributions to public health, especially in the improvement of living conditions, which diminished epidemic typhus; and the provision of a sewerage system for Berlin (Fig 1.14), which diminished the incidence of cholera.

In politics Virchow opposed the expansion of Prussia and expenditure on the military, but Bismarck's successes in the wars respectively with Denmark (1864), with Austria (1866) and with France (1870), together with the rise of left-wing political groups – such as the Social Democrats – weakened Virchow's position. His support for Bismarck's anti-Catholic policies (1870s–1880s) – which Virchow referred to as *Kulturkampf* ("culture struggle") – led to Virchow losing the support of many liberal Catholics.

Virchow also became interested in anthropology and founded the Society for Anthropology, Ethnology and Prehistory / *Gesellschaft für Anthropologie, Ethnologie und Urgeschichte* which was very influential in coordinating and intensifying German anthropological and archaeological research. His archeological works included participating in Schliemann's famous first excavations of the Ancient Greek city of Troy, as well as an extensive journey to the ancient sites in Egypt.

In this later period of his life Virchow maintained his interest in medical matters and his colleagues included Roloff, Helmholtz, Du Bois-Reymond, Hirsch and Gurlt (chapter 6h, 6j, 6k, 6l, 6o), and he had wide contacts, including

the famous surgeon von Volkmann (chapter 6i). In later years (Figs 1.15–1.18) Virchow was considered the 'Father' of modern pathology, and was invited to give numerous addresses on various occasions, including international meetings (for example in Rome in 1893 – chapter 5).

It can be noted here that Virchow as head of the Institute of Pathological Anatomy had several *Assistenten* at almost all times. Thus Hansemann was initially appointed 3rd *Assistent* in 1886, rising to 1st *Assistent* by 1893 (Bignold et al, 2007). Further, until late in life, Virchow continued to practice as a physician at the Charité. He was responsible for the so-called 'combined ward' (Köhler, 2005) in that hospital and was supported by clinical *Assistenten* in that capacity. Among these was Obermeyer (also spelled 'Obermeier', see Appendix 1b) and Semon (Appendices 1a and 1c). Thus Virchow's direct influence on young doctors was wider than just on the undergraduates of the Medical School and his *Assistenten* in pathological anatomy.

This introduction is directed mainly at the issues mentioned in the texts of the tributes: – the cultural context; sectarian issues; pathology and 'scientific medicine' in Germany in the early nineteenth century; in addition to the origin and meaning of 'Cell Theory' (1830s and 1840s). The details of his life are sketched in the obituaries and other material given in Appendix 1, and provided in detail in numerous books (e.g. Ackerknecht, 1953a; Schipperges, 1994; Dhom, 2001; Andree, 2002; Goschler, 2002) and articles (see Appendix 2b), and are not discussed further. Virchow's eulogies for anthropologists are not included here, nor are any significant accounts given of his contributions to the worlds of either politics (see Ackerknecht, 1953a) or public health (see Rather, 1985). Virchow's interest in the history of medicine (see Ackerknecht, 1953a; Rather, 1990) – will not be mentioned further.

We recognize that some aspects of Virchow's contributions to specific topics in pathology have been controversial, mainly because of suggestions that he made several doubtful claims to originality in relation to 'Cell Theory', and also because of accusations that in later life, he persisted in asserting the supremacy of Pathological Anatomy as a medical science, to the detriment of others, especially microbiology (Gortvay and Zoltán, 1965; see also Bignold et al, 2008). However, in our view, none of this detracts from the fact that Virchow's work contributed enormously to the transformation of condition of medical science in the early nineteenth century – that is to say, from post-medieval, confused, speculative and often subjective theorizing to the rational, mechanistic and evidence-based condition of today.

Cultural context

Germany in the late eighteenth century consisted of over 300 separate and virtually independent states and principalities, each with its own system of taxation, weights and measures and so on. Of the rulers of these political units, vari-

able numbers, but usually eight to eleven, were 'Electors' of the Emperor of the (to give its full name) 'Holy Roman Empire of the German Nation'. This 'Empire' was in fact a loose Confederation serving legal purposes and little else. Thus the 'Empire' had no established capital city and had rarely proved strong enough to prevent its members warring between each other or forming alliances with non-German Powers.

One third of the land area of Germany was effectively ruled by the Catholic Church through bishops and archbishops. The remainder had either Catholic or Protestant secular rulers. Almost all rulers were 'absolute'– i.e. despots governing with no democratic institutions and few legal hindrances. This explains the various references in chapter 3 (Schönlein) to imprisonment without trial, and Virchow's own departure from Berlin in 1849. Since the Middle Ages there had been frequent wars between the German states. Changes of rulers occurred through success in battle and also through marriages between members of Royal Houses. In wars with foreign powers (for example, with France and Sweden) the various German states had frequently fought on opposing sides. In all this – as Virchow notes in chapter 2 – the Germans had only one persisting and reliable cultural institution in common: their Universities (Paulsen 1895; Flexner 1968; McClelland 1980). The notable academic orientation of the Germans – and it may be suggested, their deep involvement with philosophy and philosophers against which Virchow had to struggle – may well be traced to this.

In Germany, the Enlightenment at its best was characterised by precise, rational and secular critical-but-tolerant habits of thought – best represented perhaps by Kant (1724–1804) and Lessing (1729–1781; see Mauser and Sasse, 1993). However, the German Enlightenment then developed in two ways. The first was a tendency in philosophy to excessive intellectualization and thoroughness, especially in the 'systems' of thought of Hegel (1770–1831). The second was the change in mode of thought (Roberts, 2002) characterized by the German Romantic movement – perhaps starting with Herder's (1744–1803) ideas of tribal cultural characteristics, but definitely characterized by the *Sturm und Drang* literature of the 1770s. This 'romantic mode' saw the development and expression of individualism with great importance being given to personal, subjective, and even emotional experience. The totality of this view is indicated in German by *Innerlichkeit*, which is only incompletely rendered as 'inwardness'. In the early nineteenth century this 'romantic mode' of thought came to be applied to the sciences including medicine (Cunningham and Jardine, 1990; Poggi and Maurizio, 1994; Roberts, 2002). In an important respect, the romantic movement complicated German thinking enormously by adding 'subjective versus objective' to the already-existing polarities in thought among German philosophers of 'liberal versus conservative' (traditions) and 'secular versus liberal religious versus clerical-revivalist' (religious convictions) – see Gottfried (1979).

Also at the end of the eighteenth century, the political conditions of the German people varied enormously from state to state – from 'free' cities such

as Hamburg and Frankfurt, with their own local governments – to states in which serfdom persisted little-changed from the Middle Ages. Two thirds of Germans lived in rural areas. Travel was on foot, horses or river boats. Thus movement from one University to another was difficult, and few 'conferences' of academics were possible. Letter-writing was generally the only means of communication between separated friends or academics at different Universities. Music was usually composed by commission at the behest of clerical or secular rulers. The institution of the 'court composer' illustrates this, e.g. Mozart in Salzburg, Hadyn in the employ of Prince Esterhazy. Both were typical for their times, and were literally liveried Court employees.

The contrast can now be made with the situation in Germany at the end of the nineteenth century. The German-speaking world had been resolved into the 'German Empire' (based on Prussia) and the 'Austro-Hungarian Empire' with a small component in Switzerland. Rule was by (limited) constitutional monarchies, serfdom had been abolished, and two-thirds of Germans now lived in towns, most of which were connected to the national system of railways. The population had increased approximately threefold and university students had increased in number to an even greater extent (Jarausch 1982; Cocks and Jarausch 1990). National and international academic conferences were commonplace. Philosophy as a method of establishing truth in scientific questions had been almost completely replaced by rationalistic/mechanistic consideration and experimentation. The pride of particularly the Prussians in their achievements was considerable, and military sayings entered the German language to greater degrees as militarism entered its culture. Composers were free spirits and usually secular, who wrote for themselves and for the public. Among them, Wagner, Richard Strauss, Johann Strauss and Lehar were particularly popular in Germany.

In all of this, we must remember that there was no telephone, radio, television or other electronic aids. Individuals communicated with each other face-to-face or in writing, and individuals heard from their leaders in public meetings or in the newspapers. Hence orations, particularly the longer ones (chapters 2–5) were a major means of communication in the academic world, and happened much more frequently and on a much greater scale than has occurred in the later twentieth century. Thus in reading these chapters, it should be remembered that they were all primarily speeches at large meetings of academics and other learned people.

Sectarian issues

In the context described in the preceding section, it is not surprising that secular issues should arise in Virchow's eulogies. The Reformation, Counter-Reformation and associated wars had not resulted in either Catholic or Protestant supremacy in Germany, as had happened in England and France. The German

Enlightenment was associated with greater secular questioning of faith and a drift of the German Catholic Church towards liberalism. There was also a general acceptance by the German Catholic Church of secular authority over some church matters, such as the appointment of bishops ('Febronianism'). However, during this period, ideas of re-establishing the social order of the Middle Ages ('Millenarianism' – see Gottfried, 1979) were retained by some clergy.

During the whole of Virchow's lifetime and the period relevant to these tributes, significant changes occurred which resulted from the effects of French Revolution and Napoleonic Wars. In particular, Napoleon abolished most of the German monasteries and abbeys. Further, all the ecclesiastical principalities and almost all the smaller secular political units were consolidated into thirty-nine secular states. Napoleon also closed a large number of German Universities (e.g. Bonn and Bamberg) during the secularization, perhaps because they contained faculties of theology for training priests as well as being centres of resistance to French domination. After the fall of Napoleon and the Restoration of the monarchies in Europe, the 'Millenarian' and other conservative elements in the Catholic Church sought to reverse the liberal and political progress of the secular rulers during the Enlightenment and Revolutionary-Napoleonic period. Significant in this was the re-establishment in 1814 of the Jesuit Order (which had been abolished in 1772 by Pope Clement XIV under pressure particularly from the Bourbon sovereigns of Europe).

In Prussia there were particular factors exacerbating secular strains. At the end of the Thirty Years War (1618–1848) Prussia was predominantly German and predominantly Protestant. However, in three partitions (1772, 1793 and 1795) of the previously independent state of Poland (the 'Polish-Lithuanian Commonwealth'), a significant Slav-Catholic population was acquired in eastern Prussia. There, Junker administration was established over mixed German-Protestant and Slav-Catholic populations. Then in 1815, by the Congress of Vienna, Prussia gained extensive western territories – including much of what is now 'North Rhine-Westphalia' – which contained mainly German Catholics. Although the Prussian Government continued to exclude the Jesuit Order (after the latter's re-establishment in 1814) from its territories, a revival of Catholicism occurred among those German Catholics not under Prussian control. The timing and driving forces behind this revival are controversial (see Clark, 2003), but by 1844, there had been sufficient revival for 500,000 Catholics (it is alleged – p 187 in Gross, 2005) to make a pilgrimage to Trier (population then 20,000).

Church-State relationships altered again in Prussia after the Revolution of 1848. The Catholic Church had supported the Protestant Prussian king against the (mainly secular) revolutionaries of 1848, and was seen as a force for social order and established rule. Thus when the Constitution of 1850 came into force, the exclusion of the Jesuits from Prussia was ended, and further, the Church found that it could control elected representatives in the new Prussian *Landtag* (House of Assembly).

After 1850 (if not before) the Church's strategy was two-pronged. First, Jesuit priests were sent on 'missions' to all areas of the new Prussia, to preach morality, piety and the Wages of Sin mainly among the lower socio-economic groups. Secondly, in what became known as 'Ultramontanism' (i.e. greater power north of the Alps for the Church of Rome), the Catholic Church began to reclaim its old influence over regional churches and – most importantly for the events described in this book – demanded the return to the Prussian Catholic church its traditional areas of responsibility, such as the appointment of bishops, financial dues and authority in doctrinal matters. This second programme – again using the agency of the Jesuit Order – culminated in the declaration of 'Papal Infallibility' by Pope Pius IX in 1864.

Finally, the additional annexations of territories after the Austro-Prussian War of 1866 and the absorption of Alsace and Lorraine into Prussia after 1872, added another large number of German Catholics to Prussia's population. Thus, the leaders of Prussia saw the continuing activities of the Catholic Church as a clear threat to the process of integration of the new territories into the German Empire (Second *Reich*), if not an attack on Prussian Protestantism itself. No doubt 'Papal Infallibility' resembled the *dictus Papae* and the Papal Bull of 1302 (in which the Papacy had claimed temporal sovereignty over all Christendom) too strongly for the spectre of a new Counter-Reformation by the Catholic Church not to be raised in Protestant minds generally.

In the 1870s, the Prussian Government enacted anti-Catholic, and in particular anti-Jesuit measures in a campaign to which Virchow gave the name *Kulturkampf*. The detailed history of this is available in many books (e.g. Ross, 1998; Clark, 2003; Gross, 2005), but we may observe that Virchow – a liberal – joined with Bismarck in all of this legislation, probably for several reasons. The first was probably because of the anti-Catholicism to which he had been exposed since childhood in Pomerania (see Virchow's letters to his parents, Rabl, 1907). Second, there are clear statements of his perception that the Church was opposed to rationalism, science and progress both in the late 1840s (Rather, 1990) as well as in his account of the arguments between Ringseis and Schönlein (chapter 3). Third, as a nationalist, he would have been opposed to any threat to Prussian interests, and particularly the integrity of the German Empire. This development split the *Fortschrittspartei*, and hence damaged Virchow's standing in politics, particularly among liberals, Catholics and secular regional groups such as the Poles (Ackerknecht, 1953a).

Aspects of pathology and 'scientific medicine' in Germany in the early nineteenth century

In these tributes there are many examples of Virchow's major concern to establish 'science', and particularly the anatomic sciences, as the proper basis of medical practice (see Rather, 1962; Bignold et al, 2008). In Germany the issues

which may have underlain the whole problem of irrationalism in medical theory were mainly the growing appreciation – through careful observation of scientific analysis – of 'developmental changes' in biological and medical processes; the failure of mechanistic explanations of these phenomena; the 'intrusion of the philosophers' and finally, the example of the French. Virchow gives an excellent brief account of this in chapter 3 (Schönlein).

'Developmental changes' began to be recognized as an essential biological process when, in the early eighteenth century, it became understood that 'preformationism' (all anatomical structures appear by simple growth of pre-existing miniature ones) was untenable (Nordenskiold, 1928; Gasking, 1967; Farley, 1982; Churchill, 1991). After that, all biological study had to contend with the fact that embryological development occurs by processes ('epigenesis') which meant specifically that earlier, simpler structures give rise to new and especially more complex structures. From this conceptual shift grew the interest in comparative anatomy and comparative embryology of plants and animals. The most prominent studies of these processes include Harvey's (1651) investigations of the development of the chick, and those of Caspar Wolff, the elder and younger J. F. Meckel, Oken, Pindar, von Baer and others (Garrison, 1929; Hall, 1983; Churchill, 1991; Gilbert, 1994). Goethe took up this idea in finding that the whole individual plant develops from the leaf (in his 'Metamorphosis of Plants', 1790), and that the skull develops entirely out of vertebral bones (Virchow, 1861). Of note here is that early in his career Schönlein had an interest in the subject (chapter 3). However, only with the advent of better microscopes in the 1830s, did the whole field became susceptible to further fruitful investigation. This opportunity accounts for Müller's intense interest in the subject in later life (chapter 2). In medicine, 'the development of disease-phenomena' became the conceptual basis of the "Natural Historical" / *naturhistorische* school of which Schönlein was a major representative (see chapter 3 and Bleker, 1983). For Virchow, the concept became important because through his studies of diseases of bones, he determined that one type of cell could develop from another (a process referred to by him as 'histological substitution' from which he later separated a subtype which he called 'metaplasia' – Virchow, 1871; 1884).

The second issue to be considered is the results of the failure of mechanistic explanations for pathological processes. This was most significant because scientists of the time had inherited from the Ancient Greeks the assumption that simple overarching explanations of natural phenomena are possible, and can be achieved with minimal knowledge of underlying physics and chemistry. Thus, in the eighteenth century, European scientists were faced – after the abandonment of the 'Humoral Theory' of disease – with only meager advances in the physical sciences (mainly magnetism and electricity) and in the biological sciences (mainly in nutrition, the circulation of the blood, and the actions of nerves) to support any new theories. The response of many scientists of the time was, unfortunately, in the Ancient Greek tradition, which was to dream up

new theories of diseases according to these meager new findings. The result was that many alternative approaches to theory of disease – none of which were convincing – appeared, including:

> "Metaphysicians, Idealists, Iatromechanists, Iatrochemists, Experimental Physiologists, Natural Philosophers, Mystics, Magnetizers, Exorcisers, Galenists, modern Paracelsian Homunculi, Stahlianists, Humoral-pathologists, Gastricists, infarct-men, Broussaisists, Contrastimulists, Natural Historians, Physiatricists, Ideal-pathologists, German-Christian theosophists, Schönleinian epigones, Pseudo-Schönleinians, Homoeobiotics, Homoeopathists, Isopathists, Homoeopathic Allopathists, Psorists and Scorists, Hydropathists, Electricity-men, Physiologists after Hamberger, Heinrothians, Sachsians, Kierserians, Hegelians, Morisonians, Phrenologists, Iatrostatisticians". (Jahn, cited by Pagel, 1945).

As examples in this book, we note that Müller (chapter 2) spent much time on the concept of the 'Life Force', which his *Assistenten* Helmholtz, Brucke and Du Bois-Reymond would confidently declare did not exist on existing evidence. Virchow gives a good account of this in chapter 2, and as a side-light, Virchow himself gives the amusing example of a Professor of Physiology at Würzburg who believed that the 'magnetism' of certain chairs could cause disease in anyone who sat in them (chapter 2, Document Note 21). We note also that Broman (1996) gives an excellent general account of German Academic Medicine in the period.

The third point to consider is not just the following of Ancient Greek traditions in natural science (above), but the attempt to establish new philosophies by which to arrive at truths. This 'intrusion of the philosophers' probably occurred as a result of both the increasing complexity of the discovered scientific facts (especially facts of development, see above) in combination with the concurrent failure of any known basic science to explain them. Essentially in Germany, the process involved the application of the new 'Romanticism' (Cunningham and Jardine, 1990; Poggi and Maurizio, 1994; Pinkard, 2002; Roberts, 2002) to biology and medicine. As an early – and perhaps extreme – example, Schiller, in his (unsuccessful) medical doctoral thesis entitled "The Philosophy of Physiology", included the Romantic passage:

> "Amongst the organs (of senses) which change the object, the eye is the broadest, most beautiful, most noble; I see bodies when I perceive the vibration of light on their surfaces. And now, inasmuch as my spirits of nerves (*Nervengeist*) could not exist on the surfaces of these bodies, therefore the subordinate power of the eye must have made the light vibrate on the spirit of the nerves when it vibrated on the surface of the bodies". (Slightly adapted from Schiller, 1779).

Subsequently, the tendency to romanticism was increased by authors who combined the work of Schelling (1775–1854) – 'Ideas to a Natural Philosophy' (1797) / *Ideen zu einer Philosophie der Natur* – with previous inclinations to 'Systems' (as in Hegel). As a result, in the first decades of the nineteenth century, many doctors in Germany began to create new systems of medicine to make names for themselves. Thus Schönlein (chapter 3) is noted in his Inaug-

ural Dissertation to have used 'Romantic' language, but in later life, avoided writing on medical issues at all. Virchow gives an account of this in chapter 2, and Cunningham and Jardine (1990) as well as Roberts (2002) present excellent detailed studies.

The final point to consider here is that for German medicine, there was the example of the French. The French Revolution (1789–1793) had destroyed the French Monarchy, much of the aristocracy, the Royal Academies and all but one of the individual French Universities. On the other hand, it encouraged the sciences, so that in a short period of time, there were major improvements, such as the introduction of the metric system of weights and measures.

In medicine the 'Parisian School' which had developed in the middle of the eighteenth century, was enhanced by new original thinkers such as Cuvier (1769–1832), Broussais (1772–1838), Dutrochet (1776–1847), Bichat (1771–1802) and Laennec (1781–1815). These authors introduced new approaches to the study of organs and tissues and new techniques for physical examination with the newly-invented stethoscope respectively. The pace of scientific research continued in post-Napoleonic France, when great progress in biology and medicine was achieved by the work of Cruveilhier (1791–1874), Raspail (1794–1878 – Weiner, 1968), Andral (1797–1876) and others (Ackerknecht, 1953b; Klemperer, 1957, 1958, 1961; 1963; Rather, 1966, Hannaway and La Berge, 1998).

But in Germany, the French advances in medicine and biology were not being absorbed. The techniques of microscopy in France (La Berge, 1994) and in some respects in England were more advanced than the corresponding practices in Germany. Valentin and Gruby (see Kisch, 1954) had noted the appearances of cells, as also had Raspail, who on the basis of studies of normal botanical specimens declared *omnis cellula e cellula* (Weiner, 1978). Robert Brown (1773–1858) had described the constant presence of the nucleus in plant cells in 1830. And in clinical medicine too, French developments were overlooked. Thus the stethoscope and the diagnostic techniques of percussion and auscultation, which had been developed by Laennec (see above), was hardly used in Germany. For example, in the 1830s, Schönlein was said to be the only German practitioner using these methods (chapter 3).

Thus in summary, when Virchow began his medical career, Germany could be seen to be leading in the fields of comparative anatomy and embryology, but behind other countries in scientific and clinical medicine. German medicine was also obviously distracted by irrational and Romantically-influenced overdeveloped philosophies.

The origin and meaning of 'Cell Theory' (1830s and 1840s)

The invention of the achromatic lens for microscopes was the major technical development which placed the Germans on the road to leadership in scientific investigation of disease (Bracegirdle, 1978) – and set Virchow on his life's mis-

sion. These instruments provided magnifications of 300x, compared with those of approximately 100x which could be achieved by the best simple lenses. This magnification was too slight for chromosomes to be seen, so that microscopy as it is known today had to wait until the discovery of apoachromatic lenses in the 1870s.

Together with the staining methods developed previously (using iodine solutions, by Raspail, see Weiner, 1968) these lenses allowed for the discovery of the primary importance of cells in the formation and development of the tissues (see, for example, Vogel, 1847; Kölliker, 1853).

Virchow in his eulogy for Schwann (chapter 6g) and in his address on Morgagni (chapter 5) attempted to portray the issue of 'Cell Theory' in terms of the origin of cells, and claimed priority for discovering 'all cells from other cells' for himself. The matter is not straightforward, and Virchow's claim is controversial. The roles of other workers (Raspail, Remak, Valentin, Purkinje and others) and the details of Virchow's actions are discussed particularly by Rather (1962; 1971), Rather et al (1986, pp 1–55), Harris (1999) and Otis (2007) but relevant considerations are also given by Cameron (1952a), Kisch (1954), Hughes (1959) and Schmiedebach (1990).

The assessment of priority in 'Cell Theory' perhaps really revolves around which component of 'Cell Theory' is under consideration. Thus the part-issues are:

(i) the discovery of 'cells' in the sense of structures 5–20 micron in size in tissues;

(ii) the realization that some cells come from pre-existing cells under some circumstances;

(iii) the realization that all cells come from pre-existing cells in all normal circumstances;

(iv) the realization that all cells come from pre-existing cells in all pathological conditions as well;

(v) the realization that all cells come from cells like themselves (*omnis cellula e cellula ejustum generis*);

(vi) that the metabolism of the tissues occurs in cells (i.e. not in the interstitial tissues), and all interstitial materials are the products of the cells' activities, as well as,

(vii) that pathological lesions arise and have appearances according to the disturbances (of actions, or in reactions or 'degenerations') of the normal metabolism of cells – and in which the interstitial material is passive, or plays only the simplest mechanical or chemical roles.

Rather et al (1986), Harris (1999) and Otis (2007) concur that Virchow did not 'discover' that normal cells (which can reasonably be credited to Swammerdam –

Cameron, 1952a) nor that cells come from one another (earlier by Raspail – Weiner, 1968), nor even that they are the basis of local tissue metabolism (Schwann, chapter 6g). Thus Virchow's claim that he himself discovered 'all cells from other cells', without any qualification, may be confusing. Nevertheless, Virchow certainly proclaimed effectively that all cells come from other cells in all pathological conditions, and that the lesions of disease represent the outcomes of the actions, reactions and degenerations of cells at the local sites of disease. This concept – because it could be linked to symptoms, signs and biochemical disturbances in the patients – ultimately became the greatest advance, because it laid the foundation of modern medicine.

Conclusion

Virchow was a leader in the advance of rational medicine in Germany and the world through the second half of the nineteenth century. Evidence of this is in the number of international lectures which he was invited to give, and the topics which he chose for those lectures, as well as the direct judgments of his contemporaries as described in their obituaries for him (chapter 7). His arguments for Cellular Pathology swept away the myriad speculative and ill-founded 'systems' and 'philosophies' of disease which had sprung up in the vacuum created in European medical thought after the demise of the Ancient Greek and Roman 'humoral' theories.

It is true that his forays into German politics and the whole field of anthropology were less important aspects of his life's work than were his efforts in medicine. Further, some aspects of his enunciation of Cellular Pathology were dogmatic, and his claims to priority of some particular ideas were controversial. Nevertheless, it is reasonable to suggest that these issues were details which did not matter so much as the success of the overall aim of his work, which was to foster rational study of disease for the benefit of us all.

Chapter 2

Johannes Müller, Physiologist (1801–1858): a Eulogy

delivered in the Hall of the University of Berlin by Professor Rudolph Virchow

Published by A. Hirschwald, Berlin, 1858.
With some notes from an earlier translation by A. Mercer Adam, M. D.,
printed in the
Edinburgh Medical Journal 4: 452–63, 527–44 (1858–9).

Editors' comments

Müller was undoubtedly the most prominent biological scientist at the University of Berlin at the time, and many notable individuals began their careers as *Assistenten* under him. Virchow's eulogy is in the formal style, with an account of Müller's scientific achievements, his scientific approach to medicine as well as his personal life – including humble origins – resistance to religious dogma and political inclinations. In politics, Virchow and Müller seem to have been on opposite sides. There is little mention of Müller's relationships with Virchow or his other *Assistenten*, – probably because these matters were too recent for discussion (see Otis, 2007).

Müller is usually recorded as a 'physiologist' at the University of Berlin, although he was actually responsible for teaching physiology, comparative anatomy and embryology as well as pathological anatomy. His early interests were neurophysiology and what would now be recognised as 'cognitive psychology' (his name is still used for the 'Müller-Lyer phenomenon'). However later, most of his studies were in the new fields of comparative anatomy and comparative embryology, both based on microscopy. Numerous famous German anatomists, such as Caspar Wolff (1733–1794), the elder J. F. Meckel (1724–1774) and the younger J. F. Meckel (1781–1733), Oken, Pindar and von Baer had preceded him (chapter 1). However, like other biological scientists of the late 1830s, Müller had the advantage over his predecessors of achromatic-lens microscopy and iodine-staining of cells. Thus it was understandable that he devoted his efforts to resolving the long-considered issues in these areas with the new microscopic techniques. Discovery of the Müllerian duct was one of the great results of Müller's efforts. Overall, however, Müller's ambition was to develop a 'System' of Anatomy in line with contemporary German philosophical tendencies (see chapter 1). Virchow notes (document page 42) that Müller rejected Artistole's concept of a 'Ladder of Nature'. However, not noted by Virchow is that Müller also specifically rejected the idea put forward by J. F. Meckel the Younger in the 1820s that the development of higher animals is a summary of the 'ancestral stages' of the forms of lower organisms (Garrison, 1929). It may be noted here first that Meckel's idea was taken up by Haeckel as his 'Biogenic Law' – "Ontogeny recapitulates Phylogeny" – in support of Darwinian evolution and second, that Virchow was opposed to Darwinism throughout his life.

Müller was not very interested in either pathological anatomy or clinical medicine. One reason why he was so interested in Virchow's returning to Berlin may have been that the latter could take over the teaching of that subject. On Müller's death, his position was filled by two Professors – Du Bois-Reymond (chapter 6k) in Physiology, and Reichert (1811–1883) in Comparative Anatomy.

There is a suggestion that there was no particular warmth in the relationship between Müller and Virchow. However, in the period 1856–58, when they were both Professors in the medical faculty in Berlin, Müller seems to have been absent on biological expeditions. Thus there may have been little opportunity for contact between them.

A longer eulogy on Müller was written by Du Bois-Reymond in the same year as this one – 1858. Rather et al (1986) and Harris (1999) provide discussions of Müller's role in the development of Cell Theory. A volume on Müller at the time when Virchow was his *Assistent* has been published recently (Otis, 2007). Otis has also provided an on-line article for the website of the Max Planck Institute for the History of Science, Berlin. Additional articles on Müller include Haggard and Smith (1938), Lohff (2001) Zimmer (2006).

The earlier translation of this work by Adam (1858) contains only a few errors, and we have retained some of that author's notes in this translation – indicated as "Adams". Our annotations are indicated as in other chapters by "e".

Editors' summary of points

Main text: P 3–5 Introduction; 4–8 early life, Görres; 8 Catholic religion; 9 University of Bonn; 10–11 begins interest in imagination images; 12 German universities at the time; 13 Müller's studies; 14–16 the state of the sciences at the time; 17–18 Müller goes to Berlin, Rudolphi; 19 return to Bonn, multiplicity of research interests; 20–21 Müller suffers a nervous breakdown (1827); 22–23 further work on imagination images; 24 returns to experimental methods in physiology, especially of reflexes; 25 comparative anatomy and embryology of the genital tracts and other investigations; 26 called to the Chair of Physiology in Berlin; 27 Rudolphi's views; 28–29 begins work on the "Handbook of Physiology", approach to subject, nature of his contributions; 30 works in comparative anatomy and embryology; 31 begins Müller's Archives; 32 microscopy and work on tumours; 33 Müller's pupils, the Cell Theory, lack of interest in pathology; 34–36 further researches into comparative anatomy, especially of marine life; 37 rising tension with work, role as Rector of the University during the revolution of 1848; 38 effects of shipwreck, declining health and death.

Notes: These are almost all citations of references or short comments. On p 41 is a long quotation concerning Müller's philosophy, excerpted from his preface to "Developmental History of the Genitalia" (1830). On p 44 is a description of Müller as a lecturer. On p 47 there is a long account of Müller and the revolution of 1848.

Nearly three months have passed since that spring morning when the shattering news of Johannes Müller's sudden death spread throughout Berlin. Since then new buds have burst forth, new life has unfolded, and fresh activity has pressed in us from every side – but on no single day have we been able to forget the memory of that dead man, whose body we have returned to the bosom of mother-earth.

Standing at his coffin, we listened to those words of consolation which, according to the custom of our land, are offered by the clergyman to family and friends. The Academy of Sciences, in open session, has paid fit homage to the memory of its late eminent member, through the voice of that scholar who had longest been his colleague. And pupils and friends from far and near[1] have gathered together the long list of scientific distinctions which our unforgettable teacher had earned by the most assiduous of labour.

But no praise can bring back him whom we have lost; and ever more painfully do we recall him whose sturdy manhood gave promise of a long life.