

John Goodsir and local opposition to Rudolf Virchow's election to Fellowship of the Royal Society of Edinburgh in 1868

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In 1869 Rudolf Virchow, the distinguished Prussian pathologist who pioneered the modern concept of cellular pathology, was offered an honorary Fellowship of The Royal Society of Edinburgh (RSE). However, the Rev. Joseph T Goodsir, Fellow of the Royal Society of Edinburgh (FRSE), the brother of Professor John Goodsir FRSE, the famed Edinburgh anatomist who had died two years previously, mounted a campaign to stop the award. As part of this he published a pamphlet entitled *Grounds of Objection to the Admission of Professor Virchow as an Honorary Fellow of the Royal Society of Edinburgh*. The disagreement centred on John Goodsir's pioneering research and writings on cell theory. These had in fact been recognised by Virchow, who dedicated the English language edition of his most famous publication *Cellular Pathology* to John Goodsir. Joseph Goodsir was not, however, satisfied by this and the basis of his objection was that Virchow had plagiarised from his brother. We describe the background and outcome of this dispute.

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Background

The Royal Society of Edinburgh was established in 1783 and its Fellowship is a greatly valued honour, recognising significant contributions to medicine, science, letters and public life. Additionally, a small number of Honorary Fellows are elected each year based on truly outstanding contributions to science or letters globally. In the past, Honorary FRSEs have included such diverse figures as John James Audubon, Lord Kelvin, Robert Ferguson and Paul Ehrlich. In 1869 Rudolf Virchow, the greatest pathologist of his age, was nominated for an Honorary FRSE. Virchow's international renown was based largely on his celebrated book *Cellular Pathology*,¹ which condensed his previous research and other available knowledge into 20 lectures and brought to the medical profession a step change in the way of looking at pathology. It was published in many languages and the English edition was dedicated to John Goodsir FRSE (1814–1867), who had died two years previously. John Goodsir was sometime Conservator of the Museum of the Royal College of Surgeons of Edinburgh and Professor of Anatomy in the University of Edinburgh. His brother Joseph Taylor Goodsir FRSE (1815–1893), however, mounted local opposition to Virchow's election to Honorary Fellowship of the RSE. This extended to the private publication of a pamphlet entitled *Grounds of Objection to the Admission of Professor Virchow as an Honorary Fellow of the Royal Society of Edinburgh*.² This pamphlet was circulated amongst the FRSEs.

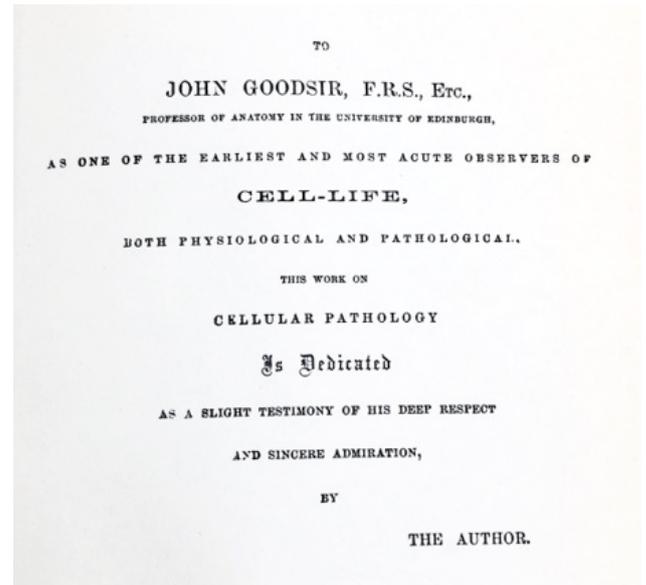
Rudolf Virchow

Rudolf Ludwig Carl Virchow (1821–1902) (Figure 1) was born in what is now Poland and studied medicine from 1839 to 1843 at the Friedrich-Wilhelms University, now the Humboldt University of Berlin.³ In a stellar career he became recognised for melding together the two emerging ideas of anatomical pathology and cell theory, thereby developing a new cell- and tissue-based concept of pathology. He published over 2,000 papers and his book *Cellular Pathology*¹ laid out this new discipline as a series of lectures; it was immensely influential. Subsequently Virchow has been named as the 'father of modern pathology'⁴ and he accumulated numerous honours over his lifetime in recognition of his work, coined many pathological terms and had many anatomical terms named after him.^{3,4}

In the face of this recognition and celebrity, it is surprising to learn that when the Royal Society of Edinburgh offered Virchow an Honorary Fellowship, there was local opposition. The reason lies in the development of the understanding of cells and the origin and maintenance of tissues that was developing across the world and especially in Europe in the mid-nineteenth century. All of this was available to Virchow, in addition to his own considerable researches, when he was assembling his case for the cell-based system of pathology summarised in *Cellular Pathology*. In particular, in 1845 the

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Figure 1 Rudolf Virchow**Figure 2** The dedication to John Goodsir that appears at the start of Virchow's *Cellular Pathology*

Edinburgh anatomist John Goodsir had published on cell theory, on how tissues originated, how they were maintained and their autonomous nature.⁵ Virchow was impressed by Goodsir's writings on this topic as well as Goodsir's work on the laying down of bone by cells we now know as osteoblasts.^{6,7} Virchow recognised Goodsir's contribution by dedicating the English language version of *Cellular Pathology* to him (Figure 2). He also cited Goodsir once in *Cellular Pathology*, but as described below, Goodsir's supporters, especially his brother Joseph Taylor Goodsir, felt that Goodsir's contribution had not been adequately recognised by Virchow in *Cellular Pathology*.

Figure 3 John Goodsir

John Goodsir

John Goodsir (Figure 3) was born one of six siblings, in the fishing village of Anstruther in Fife, where his father and grandfather had been doctors. Three of his brothers also became doctors: Henry Duncan Spens Goodsir (1819–1848), known as Harry, Robert Anstruther Goodsir (1823–1895) and Archibald Goodsir (1826–1849). Harry eventually became Assistant Surgeon on the ill-fated Franklin expedition of 1845. Another brother, Joseph Taylor Goodsir (1815–1893), studied divinity at the University of Edinburgh and upon ordination returned to East Fife as a minister. He wrote several books on religious matters and in 1868 he was elected FRSE.⁸ John Goodsir attended St Andrews University between 1827 and 1830, then transferred to Edinburgh University Medical School and also attended classes at the Royal College of Surgeons of Edinburgh (RCSEd). Goodsir was first taught by and then worked with, Robert Knox, then the most eminent anatomist in Edinburgh. In 1841, as Goodsir's reputation as an anatomist grew, he was invited to become Conservator at the museum of the RCSEd. In 1843 he became Curator of the University of Edinburgh anatomy collection, while Harry Goodsir took over Conservatorship of the Surgeons' Hall Museum of the RCSEd, which had recently been expanded by the incorporation of the Bell and Barclay collections.⁹

Following a short period as demonstrator to Alexander Monro *tertius* (1773–1859), the Professor of Anatomy in the University of Edinburgh, John Goodsir was appointed his successor in 1846 and was elected FRSE in 1848. He died in Edinburgh in 1867, aged only 52 years.^{9,10}

Goodsir published many papers on a diverse range of biological subjects in addition to human anatomy and pathology. A year after he died, all of Goodsir's publications, plus some lectures, were edited by William Turner (1832–1916), an eminent anatomist and successor to Goodsir in the post of Professor

of Anatomy in the University of Edinburgh. They were published with a biographical memoir by Henry Lonsdale (1816–1876) in two volumes entitled *The anatomical memoirs of John Goodsir Volumes 1 and 2*.¹¹ Lonsdale was a distinguished Edinburgh Medical School graduate who was admitted as Fellow of the Royal College of Physicians of Edinburgh, became Senior President of both the Royal Medical Society and the Anatomical and Physiological Society and was later appointed physician to the Royal Public Dispensary.

Goodsir's major contribution to cell theory: 'Centres of nutrition'

By the mid-nineteenth century the reductionist view of the structure of the human body was a matter of debate. Prevailing opinion was, as typified by the eminent pathologist Carl Rokitansky, that the cell had no special status in bodily organisation and that both fibres and cells were produced extracellularly from connective tissue blastema and that both were important.¹² Goodsir championed the microscope as an anatomical aid and was insightful regarding what he saw whilst cognisant of the problems of interpreting the world that the microscope revealed. As extensively and insightfully discussed by Jacyna,¹² Goodsir was amongst the earliest to recognise the central role of the cell. Goodsir sought to integrate what he saw at the cellular level into his model of anatomy utilising the comparative anatomy of single-celled organisms and the embryological approach. There was still considerable debate as to how cells functioned, reproduced and how they were organised in the body¹³ and much of Goodsir's conclusions in this regard were first expressed in lectures given at the RCSEd in 1842 and 1843 and published in *Anatomical and Pathological Observations*⁵ as a separate book in 1845. In 1868 they were included in *Anatomical memoirs*.¹¹

The book deals with a variety of topics, the most influential and central to the present paper being Chapter 1, 'Centres of nutrition'. Here Goodsir lays out his belief in '*omni cellule e cellule*' (Latin - all cells come from cells) at a time when most researchers, including both Schleiden and Schwann, generally considered to be the originators of cell theory, believed that cells arose '*de novo*' in the extracellular milieu.^{13,14} The idea of cells arising from other cells is a key one but on its own it does not go far towards explaining the complex organisation of the human body. Albrecht von Haller (1708–777) had advanced the idea of tissues, the next level of organisation above cells, although he used the general term 'fibres' for what we now call muscle and nervous tissue.¹⁵ The concept of tissues was more fully developed by Marie Francois Xavier Bichat (1771–802).¹⁶ Bichat identified 21 different tissues, which came together in different combinations to form the organs of the human body, including mucous membranes, serous membranes, synovial membranes, the meninges etc. However, no one had yet suggested how tissues originated, developed or were maintained.

In the present day we recognise the complex processes governing the origin and maintenance of tissue, all of which have been discovered since Goodsir's time. None of this reductionist

complexity was available to Goodsir, who relied on what he saw through his microscope, described using analogies and metaphors allowed by contemporary mid-nineteenth century thought. From his research Goodsir concluded the following: that what we now call tissues are cells arranged together in 'territories', directed towards a common physiological purpose and, crucially, he suggested that the cells in any tissue exist autonomously from surrounding tissues and are specialised in function. This autonomy was based on the fact that tissues are 'centres of nutrition':⁵ that is, cells and their nuclei obtain nutrition from local capillaries and act as 'germinal centres', locally producing the cells that form the tissue. The nuclei in these centres act as 'the permanent source of successive broods of cells'. Importantly, these 'broods of cells' take their form from the tissue in which they arise, or as put by Goodsir, they arise 'under various forms, according to the texture of the organs of which their parent forms are part'. Goodsir was the first to report that germinal areas are to be found in adult tissues, having only been recognised previously in embryonic tissue. 'Centres of nutrition', or tissues, described by Goodsir amounted to 'a division of the whole (body) into departments each containing a certain number of simple or developed cells'. The maintenance of the characteristics of the tissue are ensured as follows: 'all of which (i.e. the cells in the tissue) hold certain relations to one central or capital cell around which they are grouped. It would appear that from this central cell all the other cells of its department derive their origin. It is the mother of all those within its own territory...'⁵ Although the idea that a single cell is responsible for all of the cells in the tissue is wrong, it is not wide of the mark as we now know that a small subset of cells in any tissue act as the stem cells for that tissue e.g. basal cells in the skin. Goodsir suggested that individual tissues have independent, self-perpetuating existence by virtue of the presence of the germinal centres in them that are active throughout life.

That Virchow fully grasped the pathological implications of this is evident in his paper 'Nutritive Units and Disease Foci',¹⁷ published in 1852, seven years after publication of the *Anatomical and pathological observations*. In this paper Virchow credits Goodsir for the idea of 'nutritive units' and he cites directly from Goodsir's book as follows: 'Anatomically considered, a nutritive centre is simply a cell, the nucleus of which is the continuing source of generation of younger cells'. Crucially, Virchow identifies the pathological significance of Goodsir's finding by extending the idea from the normal to the pathological condition: 'A disease focus is nothing other than a simple vegetative or circulatory nutritive unit, or a multiple of such units, nourished under abnormal conditions or in a deviant manner'.¹⁷ This observation on the autonomous nature of tissues and therefore the likelihood that pathological change can be tissue-specific, localised and self-perpetuating, has far-reaching consequences for understanding pathology at the tissue level. Rather in his essay on Virchow,¹⁸ states that 'Virchow did not subscribe to all of Goodsir's statements but some were clearly important in the genesis of his own ideas'. In particular Goodsir's early concept of tissue in the form of 'nutritive units' and 'cell territories' was key to Virchow's thinking.

The charge against Virchow of plagiarising or not properly recognising Goodsir's intellectual contribution in *Cellular pathology*

The first publication suggesting that Rudolf Virchow had plagiarised or taken from Goodsir's writings without sufficient acknowledgment, was an anonymous book review of the English version of Virchow's *Cellular Pathology* in the British Medical Journal (BMJ) of 12 January 1861.¹⁹ In this review, entitled 'Cellular pathology: its present position', the author sets the tone by commencing as follows: 'It is now some years since Professor Virchow has endeavoured, by the application of views originally brought forward by Professor Goodsir of Edinburgh, to overthrow the doctrine put forth by Schleiden and Schwann as to the cell theory. It is true that we nowhere find it stated that he is in any way indebted to Mr Goodsir'. This reference to Schleiden and Schwann is rather confusing, referring as it must to extracellular theory of cellular origin put forward by Schleiden and Schwann, in contrast to '*Omni cellule e cellule*', the theory espoused by Goodsir and the leitmotif of Cellular Pathology. Virchow most likely got the term from Raspail,¹³ whilst Goodsir himself recognised the embryologist Dr Martin Barry as first identifying the fundamental role of the nucleus of the cell as being the origin of new cells, in embryos at least.⁵ The anonymous author then places the section from Chapter 1 of Goodsir's *Anatomical and pathologic observations* of 1845 that deals with nutritive units and cell territories, side-by-side with a section of Virchow's *Cellular Pathology* of 1860; the similarities are striking. Importantly, Virchow makes no reference to Goodsir at this point in his book and the unacknowledged use of Goodsir's ideas, like 'cell territories', by Virchow 15 years later is evoked as proof that 'all that belongs to territories and brood cells which form so important a feature in the theories of Professor Virchow, originated from Mr Goodsir'. The author grudgingly admits that the dedication of the English translation of *Cellular Pathology* to Goodsir 'indicates a recognition of some sort'.¹⁹

This review is, in fact, a sustained criticism of Virchow and, as well as this statement condemning Virchow for not fully acknowledging his debt to Goodsir, the author suggests that Virchow incorporated a number of other theories into *Cellular Pathology* without acknowledging their intellectual origin. The article calls Virchow 'dogmatic' and accuses him of making assertions regarding cell theory, that are not proven but are merely 'confident plausibilities, utterly irreconcilable with the cautious spirit of research so necessary for establishing any just and true theory'.

In 1868, a year after Goodsir's death, the Royal Society of Edinburgh: Scotland's Academy of Science and Letters, elected to offer Virchow an Honorary Fellowship of the RSE, in recognition of his contribution to pathology and medicine. Hearing of this, John Goodsir's brother, the Rev. Joseph Taylor Goodsir FRSE, took great exception and seized on the above book review, to form the first part of a pamphlet *Grounds of objection to the admission of Professor Virchow as an Honorary Fellow of the Royal Society of Edinburgh*.²

This pamphlet, published privately by its author, had a first edition that contained some errors which were corrected as described in the preface to the second edition. In the same preface Joseph Goodsir justifies the pamphlet's publication: 'to do justice to my late brother in a matter of *meum et tuum*' (translated from Latin as 'what is mine and what is thine').

Grounds of objection... begins with a reprint of the side-by-side articles by Goodsir and Virchow mentioned above and goes on to quote extensively from Lonsdale's biographical memoir of John Goodsir, published in the *Anatomical Memoirs* in 1868.⁹ Joseph Goodsir mentions Lonsdale's description of the 'centres of nutrition' put forward by Goodsir, stating that this idea was freely made use of by Virchow 'without due acknowledgement'. This perceived misconduct clearly extends only to *Cellular Pathology* since, as mentioned above, Virchow had fully acknowledged Goodsir for the 'centres of nutrition' in his 1852 paper.¹⁷ Virchow's citation of Goodsir in that article reads: 'I believe that to Goodsir must be ascribed the originality of the conception that the cells of the developed body, and not merely those of the body undergoing the process of formation, possess a life of their own and represent centres relatively independent of nutrition and secretion. The importance of this conception cannot long be disregarded especially when one thinks of its relation to pathology'. Joseph Goodsir continues to make use of Lonsdale's biography and states that the perceived slighting of John Goodsir in *Cellular Pathology* was sufficient for Lonsdale to claim that Virchow had displayed 'scanty civility to a scientific *confrère* whom he called one of the most acute observers of cell life – one whose labours he availed himself of, and whose opinions and words he occasionally adopted'.¹¹

Joseph Goodsir then moves on to 'parenchymatous inflammation', a process Virchow advanced as representing one of the two basic types of inflammation, the other being secretory or exudative inflammation. Based on John Goodsir's published work more than ten years previously, Joseph Goodsir claims that 'the priority of discovering the so-called Parenchymatous Inflammation unquestionably belongs to Professor Goodsir and Edinburgh'.² This general line of criticism, that Virchow did not give appropriate recognition to Goodsir, continues over the whole article. Much of this highly detailed criticism seems abstruse and 'nit-picking' and reads like someone attempting to build a case on rather flimsy evidence; ultimately, he describes *Cellular Pathology* as Virchow's 'objectionable book'.

Joseph Goodsir does mention that *Cellular Pathology*, as a series of lectures, might conceivably be exonerated from fully citing major influences, since in contrast to a primary paper, lectures do not have an absolute requirement to cite previous work. He then goes on to reject this as an excuse since *Cellular Pathology* does cite some authors more than once, but not Goodsir. He recognises that Goodsir is cited once in *Cellular Pathology* and that the book is dedicated to him in the English edition. With regard to the latter, however, he is scathing, since the foreign language editions of the book do not have this dedication to Goodsir, which he

therefore describes as a 'sop to Cerberus' i.e. a concession to conciliate a person otherwise liable to be troublesome.

In the end Joseph Goodsir states his fundamental objection to *Cellular Pathology* as 'the very last thing that would enter the mind of one who knew nothing more of the cell theory and its application to pathology, than what the reading of Herr Virchow's Lectures might convey, would be the notion that Professor Goodsir had in reality discovered the leading principles of these lectures'.²

In the final paragraph Joseph Goodsir fully clarifies his position 'I formally protest, both in my own name and in the name of any who may coincide with my opinion...against the final admission of Professor Virchow as an Honorary Fellow of this Society'. As grounds he cites plagiarism and persevering in the act of plagiarism and being guilty of unjust conduct to the 'intellectual claims' of John Goodsir.²

Responses to Joseph Goodsir's pamphlet

Response to the Joseph Goodsir's pamphlet followed quickly and in February 1869 an anonymous article, obviously emanating from the RSE, appeared in the *Edinburgh Medical Journal* (EMJ).²⁰ It claims that readers would be 'astonished and grieved to learn that the pamphlet is written to substantiate a charge of plagiarism from John Goodsir against the illustrious pathologist' (i.e. Virchow). It goes on to describe the process for choosing honorary FRSEs and how Virchow was unanimously chosen by FRSEs for this honour. It states that several Fellows spoke at a meeting to discuss the pamphlet, all condemning Joseph Goodsir's claims and exonerating Virchow of the charges. In a rather offended tone the article goes on to say that almost all of the FRSEs knew and respected John Goodsir and would never have allowed Virchow this honour if there had been any evidence at all to support the charge of plagiarism. They also point to evidence in the pamphlet that Virchow cited Goodsir in previous articles, in the book and dedicated the book to him, so negating any charge of plagiarism. The article finishes with the following:

'Joseph Goodsir has not only acted unwisely, he has done injury to the great name of his brother John, bringing it before the world in a very unpleasant connexion. A careful investigation of this dispute, as to the authorship of doctrines as to cell-territories, as well as allied doctrines on other points, will certainly remove from Virchow's name all shadow of suspicion as to plagiarism.'²⁰

This in turn elicited a response from Joseph Goodsir in the form of a letter to the EMJ of January 1869,²¹ where he expresses his offence at their stance and his disappointment. He claims that, if the writers (the RSE) take this stance, then they must believe that 'Goodsir only contributed to cellular pathology a yet unverified and quite unproductive hypothesis' and that they must think that 'Virchow is the discoverer and elaborator of all that is contained in the *Cellular Pathology*'. This is an unfair characterisation of the stance of the RSE and its Fellows in offering Virchow an Honorary FRSE and also of

Virchow's stance in *Cellular Pathology*. The tone of the letter does Joseph Goodsir little credit.

The matter was continued in 1873 in an anonymous article in the EMJ purporting to review Goodsir's *Anatomical and Pathological Observations* and Virchow's *Cellular Pathology* in their historical context and with regard to primacy in scientific discovery.²² The anonymous author of the article takes the opportunity to criticise *Cellular Pathology* for ignoring Goodsir's work, as well as the work of others whose research Virchow is accused of appropriating. Familiar ground is gone over with regard to 'centres of nutrition' and 'cell territories', viz. 'the discoveries, so laboriously and successfully made by our countryman (i.e. John Goodsir), have been made familiar in Britain through the Germans, who, so far from honouring the creator in his creation, have treated him with ignoble contempt. He deeply felt this indignity'. The author describes the dedication of the English language edition of *Cellular Pathology* to Goodsir as a *mauvaise plaisanterie* i.e. a bad joke.

A letter from Joseph Goodsir recognising and welcoming this 1873 review was published shortly thereafter in the EMJ dated August 1873.²³ In this letter he thanks the authors of the above review for 'effective reclamation on behalf of the scientific claims of the late Professor Goodsir'. However, his expression of gratitude takes only six lines, whilst the remaining part of the letter, a further 60 or so lines, comprise Joseph Goodsir extensively criticising a book that had recently been published - Kirke's *Handbook of Physiology*.²⁴ Again, by failing to cite John Goodsir's work to his satisfaction, Kirke's *Handbook* is implicated in the same conspiracy as Virchow, working to eradicate his brother's legacy.

Handwritten versions of four letters written by Joseph Goodsir were found following a search, by the authors, of the Goodsir archive in the Special Collections of the University of Edinburgh library.²⁵ These letters were addressed to *The Times* (8 August 1873), *The Lancet* (1 August 1873), the *Pall Mall Gazette* (27 January 1869) and the *Edinburgh Courant* (21 August 1879). The letters lay out Joseph Goodsir's case that Virchow plagiarised his brother's work or gave him insufficient recognition. The passage into print of the letter to the *Edinburgh Courant* was no doubt eased by the letter's forthright attack on the *Courant's* main competitor *The Scotsman* for not giving due prominence to the work of John Goodsir in a report on the publication of Virchow's *Cellular Pathology*. At the same time, Joseph Goodsir congratulates the *Courant* for its 'fair and honourable conduct' in giving due mention of Goodsir's contribution. The *Pall Mall Gazette* published Joseph Goodsir's letter and a response in which it concludes that Goodsir influenced Virchow's *Cellular Pathology* but on a relatively modest scale and that there was no evidence of Virchow's supposed plagiarism. We can find no evidence that the letters to *The Times* or *The Lancet* were ever published.

In 1873 the controversy was touched on by a Dr Joseph Coats in a lecture entitled 'The cell theory and some of its aspects', as documented in the *Transactions of the Medico-Chirurgical Society Session 1872-1873*.²⁶ In reviewing the lecture,

Dr John Gairdner rebuked the speaker for not mentioning John Goodsir. Referring to the Honorary FRSE controversy, he refers to 'one party going so far as to aver that Virchow had been guilty of plagiarism. This of course was quite erroneous'. He goes on to say that 'Mr Goodsir's researches entitle him to a mention in any summary history of the cell -doctrine'. This rather elegant bit of fence-sitting by Dr Gairdner seems rather to sum up this whole controversy, with no clear wrong being committed, but a feeling that Goodsir could have been better-recognised for his contribution.

Discussion and conclusion

Joseph Goodsir's statement of ultimate complaint regarding Virchow's book of lectures was 'the very last thing that would enter the mind of one who knew nothing more of the cell theory and its application to pathology, than what the reading of Herr Virchow's Lectures might convey, would be the notion that Professor Goodsir had in reality discovered the leading principles of these lectures'.¹ This can be turned around to formulate a question that usefully crystallises the issue at hand: 'Did John Goodsir discover the leading principles of cellular pathology?' The answer to this question is undoubtedly 'no'. *Anatomical and Pathological Observations* certainly shows Goodsir to be forward-thinking and applying his considerable intellect to explaining microscopical anatomy at that time. However, he did not take these ideas forward to formulate a general theory of cellular pathology in the way that Virchow undoubtedly did. Jumping forward 15 years to 1860 and Virchow's *Cellular Pathology*, we find an immeasurably greater and more complete concept of how pathology arises at the cell and tissue level than was advanced by Goodsir in *Anatomical and Pathological Observations*. Over these 15 years Goodsir signally failed to publish any sort of advance in his thinking over what he originally laid out in chapter one of *Anatomical and pathological observations*. In fact, according to Lonsdale, once Goodsir became Professor of Anatomy in the University of Edinburgh in 1846 he focused less on research and publishing and more on teaching. Lonsdale's opinion was that Goodsir published less 'as if afraid of lessening the fame of his position by hazarding the publication of anything rash or speculative'.⁹ Goodsir's influence is therefore not to be overstated and was well summed up by Cameron in 1952: 'it must be admitted that a wide gulf exists between his (i.e. Goodsir's) views and those of Virchow and the modern school. It is hardly possible, as some writers have attempted, to attribute the many ramifications of cellular pathology to these modest lectures (i.e. *Anatomical and pathological observations*)'.²⁷

If you take Joseph Goodsir's side then Virchow's fault was that he did not cite John Goodsir enough in *Cellular Pathology*. However, he cited him once within that book and he dedicated the book to him; he extensively cited him in previously published articles as regards 'cell territories' and 'germinal centres'. The charge of plagiarism against Virchow brought by Joseph Goodsir is a serious one but it does not, to the present authors, seem to be supported. As pointed out by an anonymous author in the London Medical Record in 1873, *Cellular Pathology* 'is in fact a general resumé of numerous

previously published memoirs and itself contains scarcely anything new'.²⁸ This might be grounds for precluding detailed referencing, which would, in such a dense book, be so great as to be detrimental to the flow of writing. The anonymous writer in 1873, commenting on the original article accusing Virchow of plagiarism,¹⁹ declares that 'the charge against Virchow accordingly reduces itself to this, that he did not, in a comparatively brief summary, repeat the historical details given a few years before in elaborate memoirs. On this the reader can pass his own verdict'.

Virchow's huge intellectual achievement in *Cellular Pathology*, no less than the placing of pathology on its modern cellular footing, covers a huge expanse of material regarding cellular pathology. Of these, 'cell territories' and 'germinal centres', as first deduced by Goodsir, are but one small, albeit important, part. The same can be said of '*omni cellule e cellule*,' which Virchow has similarly been charged with plagiarising from François-Vincent Raspail (1794–1878) by Harris,¹³ who incidentally states that 'Virchow was far from generous in his references to his predecessors'. However, lack of generosity is not plagiarism and *Cellular Pathology* is far more than 'cell territories' or '*omni cellule e cellule*', as a glance at its 20 chapter titles and their contents show; these range over infection, coagulation, inflammation, amyloidosis, thrombosis, aneurism, malignancy, nerve diseases etc. bringing clarity and detail to their cellular basis and freshly defining pathological processes.

Joseph Goodsir, who led the charge against Virchow, was no doubt profoundly affected by his brother's early death in 1867 and was fiercely protective of John's reputation and historical legacy, as he saw it. In fact, Joseph Goodsir struggled with mental health issues over the second half of his life and on at least three occasions (in 1858, 1874 and 1881), he was committed to the Royal Edinburgh Asylum for the Insane.²⁹ The first episode, in 1858, was around ten years before John Goodsir's death and Joseph's publication of the pamphlet against Virchow's Fellowship of the RSE. In fact, John Goodsir was the petitioner in the documentation to get Joseph committed to the Royal Edinburgh Asylum for the Insane on that occasion. His symptoms, mentioned in the record of admission, include melancholia, hallucinations, religious monomania and delusions of persecution. Without attempting a psychiatric diagnosis of Joseph Goodsir's condition from this distance, these symptoms do seem potentially to be contributory to his misplaced and compulsive campaign against Virchow. His mental state may also have motivated his highly public disagreement with the Church over several issues that culminated in his resignation from his post and from the Presbytery of St Andrews in 1850.³⁰ Joseph Goodsir's charges against Virchow, as laid out in *Grounds of objection*, whether sincere or the products of a confused mind, were nonetheless ruled out by his contemporary FRSEs, many of whom were closely familiar with Goodsir, his work and that of Virchow. Joseph Goodsir resigned his FRSE in 1880.⁸

With the benefit of hindsight, the impressive extent of Virchow's achievement, as laid out in *Cellular Pathology*,

is even more apparent; his reputation as the originator of cellular pathology remains secure and his Honorary FRSE was deserved. John Goodsir's contribution to the development of cell theory and thereby cellular pathology remains a substantial and impressive one of which Scottish medicine can be proud. In his review of Goodsir's contribution, on the centenary of the publication of Goodsir's *Anatomical and pathological observations*, Follis reviewed Virchow's recognition and approval of Goodsir's foresight.³¹ This amounts to three fulsome tributes to Goodsir's published

work, in all of which Virchow praises Goodsir's prescience in identifying the centrality of cells to their germinal and nutritive role in tissues and their origin from other cells.³¹ 

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