The Hangover: The Early and Lasting Effects of the Controversial Incorporation of X-Ray Technology into Chiropractic

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Chiropractic first adopted the X-ray in 1910 for the purpose of demonstrating tiny misalignments of spinal bones, theorised to cause all disease, which they called chiropractic subluxations. This paper explores the apparent contradiction and resultant controversy of a system of natural healing adopting a medical technology. It centres on the actions of B.J. Palmer, the first chiropractor to use X-rays. It also clarifies details of Palmer's decision to incorporate the technology and interprets the change in the sociological context of boundary work. The continuing use of the subluxation paradigm for radiography by chiropractors has had a lingering effect on the profession, a metaphorical hangover of vitalism that is not consistent with modern healthcare practice. As a result of this conflict, arguments within the profession on the use of X-rays contribute to the continuing schism between evidence-based and subluxation-based chiropractors.

Keywords: chiropractic, X-ray, radiography, subluxation, boundary work

Plain radiographic imaging is inexpensive, widely available, and gives a reasonable amount of information for a variety of pathological conditions. Medical doctors, dentists, chiropractors, and veterinarians make use of it. Of those professions, it seems surprising that chiropractic would embrace an invasive technology, since it is a profession that has prided itself on conservative, non-invasive methods. Indeed, the name 'chiropractic' means 'by hand' as derived from the Greek.[1] Few of the other 'natural' therapeutic systems, such as osteopathy,[2] homeopathy, naprapathy, naturopathy, etc. adopted the X-ray, although some did experiment with it for a short period.[3] Even

though it was slow to catch on throughout chiropractic, eventually this health care community enthusiastically embraced the X-ray. At first it was strictly for its own traditional purpose, that is, demonstrating chiropractic subluxations. Later, many chiropractors began using radiography in the conventional diagnostic way, although a minority adhered to the traditional chiropractic use. The purpose of this paper is to utilise the sociological concept of boundary work as a context to elucidate, first, how a profession that initially eschewed machines as diagnostic aids and therapeutic devices adopted the technology of the X-ray, and second, the controversy it caused.

Background

Three elements form the background for this paper: the theories of chiropractic, the discovery of the X-ray, and the concept of boundary work. Daniel David Palmer, known as D.D., founded chiropractic on the principle that a vertebra slightly out of position could impinge a nerve and affect the flow of vital force. He called this mal-positioning 'subluxation' and the source of the vital force 'Innate Intelligence'. He stated that it derived from 'Universal Intelligence', which was a representation of God. His son Bartlett Joshua Palmer, known as B.J., expanded and altered his father's theories, but maintained the idea that all disease was caused by alteration of the flow of impulses sent by Innate Intelligence through nerves by misaligned spinal bones. They both advocated for 'pure, straight, and unadulterated' chiropractic. This meant manual manipulation or 'adjusting' of the body's articulations as the only form of treatment for any ailment. During the early development of chiropractic a division between two main groups of practitioners arose. Some chiropractors were open to using various treatment modalities in addition to adjusting. Those included electric, vibratory, heat, cold, light, or massage techniques. The purists were called 'straight' chiropractors, practicing in the tradition of the Palmers. The others were called 'mixers', a term of denigration to indicate that they were not pure.

As the profession developed, even 'straight' chiropractors adopted tools to aid with their assessment of patients, such as X-ray and temperature sensing devices. However, therapeutically they restricted themselves to the idea that adjusting spinal subluxations was the method to release blockages of the flow of life force, which ultimately resulted in the restoration and maintenance of health, and even the curing of organic disease. For this reason, a more accurate

reference to this traditional type of practitioner is 'subluxation-based'. By contrast, an 'evidence-based chiropractor' is a more accurate term for modern 'mixers'. These chiropractors largely confine their efforts to those conditions for which peer-reviewed, published evidence exists, which are mainly musculoskeletal conditions. They utilise various non-pharmaceutical and non-surgical treatment methods. They are happy to refer to medical doctors when appropriate, and do not view spinal adjusting as a panacea. This schism continues today worldwide in chiropractic.

Wilhelm Conrad Röntgen discovered X-rays in 1895, the same year D.D. Palmer founded chiropractic.[4] Although some previous histories depict the interval before B.J. took up the use of X-rays in 1910 as brief,[5] fifteen years is a considerable span of time in terms of technological development. The medical profession understood the implications of X-rays almost immediately upon publication of the discovery and began to explore the possibilities of the new technology. By 1896, more than one thousand papers and fifty books had been published on the 'new light'.[6] It was used to investigate not just hands and feet, but the larger, central parts of the body.[7] In December 1896, X-ray images were first accepted as evidence in court cases in the United States.[8] By 1906, most exposures were down to a few seconds for a hand and only minutes for thicker body parts.[9] So by the time chiropractors adopted the technology, it was already an established medical tool; something generally considered an anathema in alternative healing systems and particularly chiropractic.

The sociological concept of boundary work essentially means demarcating a particular set of activities as belonging to a particular group. Gieryn described boundary work as 'an effective ideological style for protecting professional autonomy'.[10] He observed that it could be used in three main ways: 1) to acquire intellectual authority and career opportunities, 2) to deny resources to others, and 3) to promote autonomy and prevent or deflect political interference. These components will be addressed below.

The Crucial Role of B.J. Palmer

B.J. Palmer was the preeminent force in chiropractic and generally recognised as the most influential chiropractor of the early twentieth century.[11] The evidence also indicates that he was the first chiropractor to employ the X-ray. So it is on him that the focus of study must remain for understanding the boundary work involved in

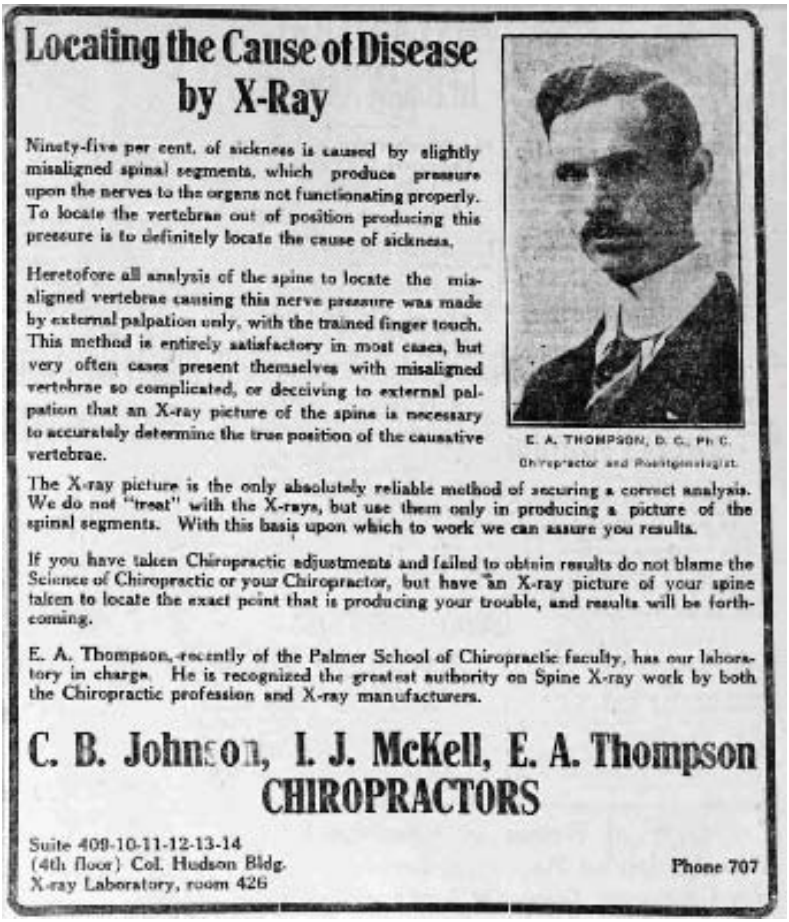
chiropractic's incorporation of X-ray technology.

It is sometimes stated that B.J. Palmer obtained the first X-ray machine in the United States west of the Mississippi River. This is untrue. The American School of Osteopathy (ASO) in Kirksville, Missouri and now known as A.T. Still University, acquired its first X-ray machine in 1898.[12] Apparently the ASO unit was the most powerful available at the time, and the second of its kind west of the Mississippi River, the first being owned by Heber Robards, MD, of St Louis, editor of the *X-Ray Journal*.[13]

It is also widely stated that B.J. Palmer was the first chiropractor to use the X-ray. Little documentation is cited to support this claim other than B.J.'s own statements that he bought the first X-ray unit for the Palmer School of Chiropractic (PSC) in 1910.[14] Since the prominent histories of this event all refer to B.J.'s claims, different sources were sought to either support or refute this version.[15] A search of newspaper archives was undertaken for articles or advertisements, since chiropractors promoted themselves with pamphlets and newspaper advertisements.[16] The medical profession in the early twentieth century disavowed the practice as unprofessional. It seems reasonable to imagine that any chiropractor who made a substantial investment in a new technology would promote it as an advantage over competitors. Articles in the *Davenport Democrat and Leader,* starting in May 1910, were found touting the Palmer School's machine.[17] The first reference found for another chiropractor with X-ray facilities was not until 1917. This happened to be B.J.'s former spinographer, Earnest A. Thompson, who had left the Palmer School of Chiropractic to start a private practice in Ogden, Utah with two other chiropractors.[18] Although absence of evidence is not evidence of absence, nothing was found to contradict B.J.'s claim to be the first chiropractor to utilise X-rays.[19]

This was technically as well as politically a difficult undertaking. In a retrospective on his actions in this regard, Palmer recalled the primitive technology, highlighting some of the difficulties with its use. His account implies an enthusiasm with which it was embraced:

> In those days we exposed glass plates. It took about 3 minutes to make an exposure. There was no leaded shield around the tube. When an exposure was being made the two large revolving disks sounded like threshing machines. We personally exposed ourself [*sic*] in hundreds of cases in a way which now would be considered dangerous, but at that time nobody knew the dangers of radiation. Thousands of glass plates were exposed, developed and interpreted on that floor.[20]



Locating the Cause of Disease by X-Ray

E. A. THOMPSON, D. C., Ph. C.
Chiropractor and Roentgenologist.

Ninety-five per cent. of sickness is caused by slightly misaligned spinal segments, which produce pressure upon the nerves to the organs not functionating properly. To locate the vertebrae out of position producing this pressure is to definitely locate the cause of sickness.

Heretofore all analysis of the spine to locate the misaligned vertebrae causing this nerve pressure was made by external palpation only, with the trained finger touch. This method is entirely satisfactory in most cases, but very often cases present themselves with misaligned vertebrae so complicated, or deceiving to external palpation that an X-ray picture of the spine is necessary to accurately determine the true position of the causative vertebrae.

The X-ray picture is the only absolutely reliable method of securing a correct analysis. We do not "treat" with the X-rays, but use them only in producing a picture of the spinal segments. With this basis upon which to work we can assure you results.

If you have taken Chiropractic adjustments and failed to obtain results do not blame the Science of Chiropractic or your Chiropractor, but have an X-ray picture of your spine taken to locate the exact point that is producing your trouble, and results will be forthcoming.

E. A. Thompson, recently of the Palmer School of Chiropractic faculty, has our laboratory in charge. He is recognized the greatest authority on Spine X-ray work by both the Chiropractic profession and X-ray manufacturers.

C. B. Johnson, I. J. McKell, E. A. Thompson
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Image 1. Advertisement from the Ogden Standard newspaper in Utah, 22 October 1917, detailing the chiropractic use of X-rays. Public domain.

A.A. Dye, a chiropractor who considered B.J. Palmer his mentor, wrote a supportive history of early chiropractic, depicting the delay in adoption of the technology as due to medical opposition.[21] He contends that X-ray manufacturers were pressured not to sell to chiropractors, who were viewed as quacks, so B.J. was unable to obtain a unit. According to Dye, B.J. met 'unsurmountable obstacles' despite making 'every possible effort' to secure one.[22] B.J.

himself characterised it differently. He claimed that he faithfully attended the Chicago Electrical Show every year and visited X-ray equipment manufacturers. He carefully watched the development of the machines until a unit was able to produce a sufficiently powerful beam to image the spine. He did not say 'sufficient for chiropractic purposes', but just 'a machine would be made which would and could penetrate the body to make pictures of spinal columns'.[23] B.J. later went on to claim that 'The first X-ray picture EVER made of a human spinal column was taken by DR. B.J. PALMER and his associates in 1910'.[24] Either he was ignorant of the fact that spines had been imaged for years, or more likely, he was embellishing the quality of the equipment he acquired and the level of his achievement with it.[25] The Palmer School did become a distributor for X-ray equipment, so perhaps these statements were useful for marketing purposes.[26]

Pierre-Louise Gaucher-Peslherbe, a chiropractor with a PhD in medical history from the École des Hautes Études en Sciences Sociales, characterised the delay in adoption of the X-ray in yet another way. He wrote that B.J. 'did not take the new invention of electro-radiology seriously, but in 1909 he changed his mind and realised that it could make a contribution to chiropractic analysis'.[27] This implies capriciousness on B.J.'s part. Given the negative attitude in the profession toward 'mixing' with any type of technology at this time, and the amount of effort B.J. expended in separating chiropractic from medical practice, it seems likely that this would have been a difficult and well-considered decision. Perhaps B.J. was not simply waiting for the technology to develop adequately but deliberating about the momentousness of the impact that a decision of this sort would have on the profession. It seems unlikely that it would have been a quick or reactionary decision. The most likely conclusion regarding the delay between the discovery of X-rays and B.J.'s adoption of them would seem to consist of multiple factors: medical opposition to acquiring the equipment, waiting for technology to develop to a higher standard, and deliberation about the change to the chiropractic paradigm of health care.

The reason B.J. Palmer adopted X-ray is clear from his writings. He was anxious to prove chiropractic subluxations existed, and he saw the technology as a means to that end. He stated that despite demonstrating many cases of diseases being resolved, chiropractic could be denied on scientific grounds until Röntgen's discovery was put to use as a diagnostic tool on humans. B.J. wrote:

> The original Chiropractic purpose was not to use the X-Ray for therapeutic purposes, to ascertain normal or abnormal tissues, the character of a fracture or whether there was renal calculi [*sic*] or a bullet in the body. We had already settled how a cure occurred; we did not care much about pathological plates … the advent of the X-Ray into Chiropractic was to **prove** that **vertebral subluxations did actually exist**.[28]

Once the X-ray was introduced, B.J. took some time to develop his certitude about its relation to palpation and other methods for the detection of subluxations. In March 1910, B.J. previewed a convention to be held in September of that year, highlighting the introduction of X-ray at the PSC and indicating that it would be a feature of the conference. There would be lectures on the taking and analysis of radiographs, and he promoted the technology to practitioners but not as the premiere diagnostic tool. At this time, he wrote: 'It is an expensive adjunct and no Chiropractor **must** have it, but it is well if you can'.[29] However, by November of that year, B.J. seems to have concluded that X-ray was the ultimate tool for chiropractic analysis of patients.[30] He wrote that palpation was seventy-five percent wrong, and that full spine radiographs should be taken on all patients, with adjustments being based on these X-ray images. 'The spinograph means the difference between failure and success: No results and results. Guess and knowledge. Doubt and positiveness. Theory and fact'.[31] Further, he claimed that all the chiropractic adjustments that had been successful prior to the visualisation of subluxations on radiographs were due to luck. The odds of determining by palpation the spinal levels that were out of alignment were no better than guesswork without X-ray, and many adjustments had been misapplied as a result.[32] The supremacy of the X-ray lasted fourteen years. In 1924 a new temperature-sensing instrument for detecting subluxations was introduced: the neurocalometer. B.J. embraced the neurocalometer as the premiere instrument for discovering subluxations, and X-ray was relegated to a lower status as a diagnostic tool.

B.J. championed the one-cause, one-cure approach, insisting that chiropractic subluxations were the ultimate cause of disease. Doctors of earlier generations treated all conditions as unique to the patient—using the argument that everyone responds differently to exposure to the same germs or pathogens.[33] Because of scientific advancement, the existence of germs could no longer be denied, and B.J.'s argument became that subluxations diminished the natural resistance of the body and allowed germs to take hold. In the early twentieth

century, machines began to make medicine more objective. It is easy to believe things seen with one's eyes, so with the X-ray machine, B.J. could show the subluxations to patients and observers. He could use this apparently objective measure to reinforce his idea that there was one real cause and one cure. Subluxation-based chiropractors continue to use this same paradigm today.[34]

Robin Canterbury, a chiropractic radiologist who has contributed to the historical literature of the profession, stated that B.J.'s use of radiography went beyond subluxation analysis, inferring that he had a broader, and what would be considered in modern times a more ethical use for the technology.[35] But this may be a wishful interpretation of the evidence. In delineating the virtues of the technology, B.J. cited examples of spinal pathology. But a contextual analysis of these writings indicates that the pathological observations were only noted in the service of subluxation analysis. He wrote that spinous processes could be bent, exostosis could confound palpation findings, and other diseases that affect the shapes of vertebrae and other bones could confuse a chiropractor as to how to find the subluxations.[36] However, the pronouncements from the preeminent chiropractic authority did evolve, eventually. A 1959 memo to the profession from the B.J. Palmer Chiropractic Clinic begins: 'When X-ray was introduced into Chiropractic, the term spinography was coined to differentiate between X-rays taken for the specific purpose of spinal analysis, and radiographs taken for the purpose of soft tissue or bone pathological diagnosis'.[37] The memo supported chiropractors in radiographing areas of their patients' bodies that may be symptomatic, but that once the radiographs are obtained, they should be sent to medical radiologists for diagnosis. This was a maturing argument, conceding that X-rays could be used for more than just subluxation analysis. It also acknowledged that chiropractors were not the only valid health care professionals, another concession to mainstream health care, recognising that chiropractors should be part of a multidisciplinary team in order to serve patients' interests better. This attitude came very late in B.J.'s life; he died less than two years later. B.J. evolved his theories of health care over time, but some of his followers have chosen different points of development of these theories and locked on to them, as if they had been divinely inspired and complete—the men who invented slight variants of B.J.'s ideas and developed them into 'technique systems' then fought, and still fight, their dogmatic ground against those most like themselves.[38] The use of X-rays reinforced the boundaries of chiropractic for subluxation-based

chiropractors, setting them out as being able to demonstrate visually their model of vitalistic health care.

Historian Steven Martin has emphasised several factors to explain chiropractic's embracing of the X-ray.[39] He acknowledged the power of B.J.'s personality and influence, which was undoubtedly a factor. He also credited the growing professionalisation of chiropractic after 1910—that is, the adoption of increasing educational standards, a willingness to accept mainstream health care evidence, and employment of mainstream diagnostic and therapeutic measures. Another factor Martin cited was the growth of the 'mixers'. Finally, he noted the importance of technology in medicine. According to Martin, these elements forced the 'straight,' or subluxation-based, chiropractors to accept radiography. These were all forces external to B.J.'s realm of straight chiropractic. However, this interpretation does not apply to the time leading up to the adoption of X-rays in 1910, and so we must look to other factors that motivated B.J. in his boundary work. It is true that after this time, B.J. employed medical doctors and other health care professionals on the Palmer School's faculty to teach certain topics like obstetrics, but in 1910 his writings indicate single-mindedness about the technology; it was to depict chiropractic subluxations. The way X-ray was, and is, used by subluxation-based practitioners sets a boundary for their definition of chiropractic, differentiating it from both internal factions (evidence-based chiropractors) and external forces (medical doctors). It provides this segment of the chiropractic community with intellectual authority by allowing the claim of being able to find life-depleting subluxations on radiographs, point them out to patients, and then 'correct' them. Career opportunities are created by the differentiation of these chiropractors from other healthcare providers. Osteopathy tried using X-ray to visualise the osteopathic lesion, but quickly abandoned it.[40] In the USA osteopathy was subsumed by medicine and so uses X-ray as a mainstream diagnostic tool for pathology. In the UK and other countries where traditional osteopathy still exists, X-ray is not in the scope of practice. This boundary also denies resources to others not inducted into B.J. Palmer's way of thinking by seminars and workshops. All these factors help promote autonomy of the subluxation-based group, due to their different methods and authority with a unique use for X-rays. Thus most of Gieryn's tenets of boundary work are fulfilled. However, it fails in one regard. The use of ionising radiation to find chiropractic subluxations is not accepted by mainstream health care practitioners, evidence-based

chiropractors, or even subluxation-based chiropractors who do not believe in the supremacy of radiography for subluxation detection. Therefore, it does not serve to prevent or deflect political interference, and indeed may initiate scrutiny and criticism from internal and external sources.[41]

Regarding the idea that B.J. was driving chiropractic towards professionalisation, the use of technology would have given an appearance of increased professionalism to chiropractors that used it. But B.J. was often quoted as saying he would rather have an uneducated student than one that was previously schooled, because an untrained mind was easier to mould.[42] This is not an indication of true professionalisation, but rather the characteristic of a military or religious leader.[43] This attitude fosters uniformity and obeisance, not critical thinking, intellectual curiosity, and scepticism, which should be expected from professionals. Perhaps B.J., in order to aid his efforts to market the Palmer brand of chiropractic, while not desiring actual professionalism, found useful the trappings of such status provided by the incorporation of technology.[44]

B.J. used his ideology, or as he called it, his 'philosophy' of chiropractic as a weapon to further his political and economic interests, and used X-ray as a boundary to help define that ideology.[45] Stylistically as well, he employed many of the resources anthropologist Clifford Geertz indicated were useful in constructing ideologies.[46] B.J.'s use of metaphor, hyperbole, sarcasm, repetition, mocking, and other elements of the style of communicating an ideology can be found throughout his considerable body of writings.

B.J. Palmer was active in boundary work throughout his career. He moved some of the boundaries of chiropractic regarding the best ways to reveal areas of the spine amenable to treatment, but other elements of his conception of chiropractic remained fixed. Concerning BJ's diagnostic, or as he called them, 'analytic' methods, he began his career continuing his father's tradition of manual palpation to find subluxations. In 1910 he supplanted palpation with X-ray visualisation of spinal subluxations. In 1924 he added the neurocalometer, although palpation was reincorporated and X-ray retained. For a short time he also advocated an early EEG-like device called the electroencephaloneuromentimpograph.[47] Although certain machines became acceptable, it was only in order to aid the detection of subluxations. Regarding his evolution of thought on which areas of the spine could be treated, early on B.J. advocated full-spine adjustments, like his father. Later he changed to the opinion that only

the upper two cervical vertebrae and occiput should function as sites of true chiropractic subluxations. He called this his Hole-in-One theory (HIO). Finally near the end of his life he went back to embracing full-spine treatment.[48] However, he never changed his vitalistic paradigm of disease. He also remained firm that the only acceptable method of treatment was manual adjustment of spinal bones. Several inventive chiropractors designed and built spinal adjusting machines in a quest for the ultimate precise adjustment, but B.J. denigrated them.[49] They were not within his boundaries.

The Roles of Other Influential Chiropractors

In order to provide context for chiropractic's adoption of X-ray, it is worth exploring the evidence of D.D. Palmer's opinion on the matter. Founder of chiropractic and father of B.J. Palmer, D.D. was an autodidact. He consulted standard texts on anatomy, physiology, and pathology in order to acquire the information to denigrate his opponents, including former students and his son. He weaponised his ideology, deploying scathing attacks on his competitors,[50] and he set the original boundaries for chiropractic, modifying them over the course of his career.[51] He was alive for eighteen years after Röntgen's discovery of X-rays, and was aware of their existence. D.D. visited the Palmer School of Chiropractic in 1913; X-rays had been in use there for three years at that point. It is reasonable to imagine that he would have voiced his opinion on his son's adoption of the diagnostic X-ray, and that he would have contributed to the direction the technology would take within the profession, or whether it would continue to be accepted at all. Unfortunately, little is to be found about his opinion, or even his knowledge of his son's use of the technology. In his 1910 book, *The Chiropractor's Adjustor,* D.D. included only one reference to X-ray in the index.[52] However, careful reading of the entire book reveals that he mentioned X-ray several times in the text. In each instance it was in its therapeutic context, though, never the diagnostic.[53]

D.D. stated that a chiropractor's adjusting room should contain a bifid table. No other items were listed, but he carefully noted all the things that one would not find, including electrical therapeutic devices such as vibrators, osteopathic tables or 'instruments of torture', microscopes, drugs, or mortar and pestle with which to mix substances. He demonstrated his wicked humour when he wrote that there should also be 'no praying to lord Jupiter to make this

prescription efficacious'.[54] D.D. firmly maintained his stance—that palpation finds the subluxation, and why would any other measure be necessary? This lack of acknowledgement of the diagnostic use of X-ray continued until the end of his life. In an article for the Universal Chiropractic College's magazine in 1913, shortly before his death, D.D. wrote about his latest chiropractic theory, based on vibrations. He drew analogies to electromagnetic vibrations, including light and X-rays, noting that the latter, although able to penetrate tissues, were 'not a therapeutical agent'.[55]

D.D. Palmer had a slightly lower degree of emphasis on the spine than his son did, and he argued in writing with B.J. on this point. D.D. stated that 95 percent of all disease was caused by subluxated vertebrae, but that the remaining 5 percent was caused by slight displacements of bones other than those in the spine.[56] So if D.D. had considered using the X-ray diagnostically, he could have used the technology to examine peripheral articulations, which were seen relatively well with the early equipment. But he chose not to. Diagnostic tools seemed beneath contempt; as if they could not tell a chiropractor anything that his hands could not. To emphasise this point, D.D. continually reiterated that his friend and patient Reverend Samuel Weed helped him find the word 'chiropractic' to describe his new practice. The word meant 'by hand,' a principle D.D. apparently adhered to unfailingly.

Father and son battled for control of the profession. D.D.'s writings give the impression that B.J. was doing nothing correctly. B.J. referred to the Palmer School of Chiropractic as 'The Fountain Head'. But D.D. repeatedly claimed that he himself was the 'Fountain Head' of chiropractic; the school that D.D. founded but B.J. took over in 1906 never could be. 'I am the Fountain Head of Chiropractic; it originated with me; it was my ingenious brain which discovered its first principle; I was its source; I gave it birth; to me all Chiropractors trace their Chiropractic lineage'.[57] He concluded that for B.J. to call the Palmer School of Chiropractic the Fountain Head was either ignorance of the definition of the term or the 'desire of a rascal to rob his parental benefactor'.[58] D.D. Palmer was known for his caustic, exquisitely detailed, and sometimes viciously funny rhetoric. He loaded scorn on those who tainted his 'discovery', chiropractic. But perhaps his greatest expression of disdain was absolute silence, reserved for the newest and most sophisticated diagnostic tools, including the X-ray. No statements of his opinion on the use of diagnostic radiology were found by the authors. At this time, B.J. was wresting command of the

profession from his father, and redefining its boundaries in order to do so. The use of the X-ray may have been one of his ways of starting to make chiropractic into an entity conforming to his own definition, not just something he inherited from his father. But Boundary work may be potentially hazardous. Before changing the parameters of a practice, a strategic practitioner must understand the mindset of peers and colleagues, as well as competitors, and consider the ramifications. B.J. Palmer either had not calculated the possible effects of re-setting this particular boundary by adding X-ray, or he did not care. He did lose allies and alienate friends because of this decision. The most prominent example is the case of Joy M. Loban and the Universal Chiropractic College.

Joy Manlove Loban was a Palmer graduate and then faculty member who later co-founded a rival school, the Universal Chiropractic College (UCC). Historians Steven Martin,[59] Russell Gibbons,[60] and Pierre-Louis Gaucher-Peslherbe[61] all indicated that that B.J.'s purchase of the X-ray machine caused a sudden exodus of staff and students from the PSC, who started a new school just a few blocks away, the UCC. However, this appears to be only part of the story. It may have been taken from an account of the incident written by A.A. Dye, who in his zeal to support B.J. seems to have simplified the issue.[62] Documents from the time indicate that there were many differences of opinion between B.J. and members of his faculty.[63] Dye hinted at this, writing that 'ostensibly' the UCC was set up in April 1910 to allow greater study of symptomatology and pathology. But he quickly dismissed the notion, indicating that really these subjects were advertised simply in an attempt to give the new school a market advantage over the established PSC.

Loban was the most prominent faculty member to leave Palmer at this time. He was a recent PSC graduate in whom B.J. had invested considerable trust and support, giving him the Chair of the Philosophy department. The documents written by B.J. and Loban at the time referring to the resignation were very cordial. They gave no indication of X-ray as the factor, and stated that Loban was leaving to go into private practice.[64] Notably, Loban had been the Palmer School's first spinographer, working closely with B.J. to obtain X-ray pictures with the school's new apparatus.[65] Unless he was pressured into this position, it would seem that he had no strong moral objection to the practice. But the evidence is conflicting. Loban and the others did indeed help found the Universal College of Chiropractic, which was down the street from the PSC in Davenport. Loban's book, published

during his early tenure at the UCC, does not include X-ray, but does give clues to other differences of opinion he had with B.J., such as the use of adjunctive therapies.[66]

Loban later gave further insight into the rift between B.J. and himself, indicating displeasure at the abandonment of palpation in preference to X-ray. Loban reasoned that the sometimes-conflicting evidence found using each method on a patient was due to the patient's recumbency during radiography reducing the visualisation of subluxations. This, he claimed, was embarrassing to the chiropractor and also gave ammunition to medical doctors who disputed chiropractic theories.[67]

In December 1918, the Universal Chiropractic College amalgamated with the Pittsburgh College of Chiropractic (PCC).[68] The UCC moved to Pennsylvania and the combined schools were called the Universal Chiropractic College. Loban had moved to the PCC prior to the amalgamation and was a major force in bringing Universal to Pittsburgh. Documents from the PCC prior to this time gave no indication of X-ray being included either in the curriculum or the school's clinic.[69] One pamphlet, though, did include an unusual pseudo-radiographic illustration. It was a drawing of a hand holding what looks like a magnifying glass over the back of a boy to reveal spinal structures. This was labelled a magno-phanto-radiograph and claimed patent-applied-for status in the image, but there was no mention of actual radiography.[70] Unfortunately, no further clarification of his opinion on radiography was obtained by examining Loban's books, the indices of which include no references to 'spinography', 'X-ray', or 'radiography'.[71]

For several years after the amalgamation, the new UCC did not teach spinography. But once it did, it was innovative with its practices, pioneering the upright, weight-bearing spinograph in 1924.[72] In announcing the advent of upright spinography, Loban took a triumphant tone, similar to B.J.'s initial announcement for the technology: 'A tremendous scientific achievement, overshadowing any Chiropractic discovery or invention of the past decade, and destined to save thousands of lives … furnishing the most convincing and absolute proof of the truth of Chiropractic that could be devised or imagined'.[73]

Early on, B.J. and Loban wrote lavish praise for each other, but after Loban left the PSC, B.J. felt betrayed, and there was no one for whom he employed a more sarcastic, condescending, and denigrating pen.[74] B.J. claimed that Loban would adopt whatever

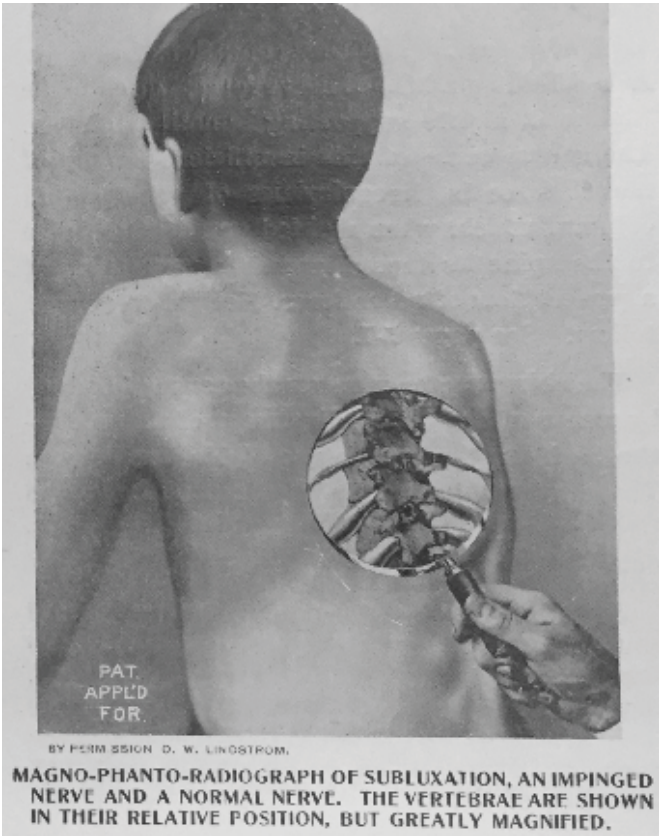

Image 2. Illustration in an advertising pamphlet for an imaginary device called the Magno-phanto-radiograph, 1912. Public domain.

proved to be popular, and specifically mentioned spinography in this regard.[75] This is undoubtedly too harsh an opinion, as Loban showed that he was thoughtful and creative in his professional life. Gaucher-Peslherbe[76] and Gibbons[77] both called UCC upright X-ray innovation 'ironic' given what they characterised as Loban's strong objections. But, as noted above, Loban was B.J.'s first spinographer, and later wrote strongly in support of spinography. Loban never renounced palpation, so possibly it was B.J.'s supplantation, rather than augmentation of palpation with X-ray analysis that caused Loban's reaction. Loban's writings on the subject advocated the use

of spinography in conjunction with palpation. It seems reasonable to surmise that he was somewhat conflicted by B.J.'s adoption of a technology and took time to accommodate the idea, as well as to gather information on its usefulness for chiropractic purposes. We may never know what Loban really thought about spinography. For a time his name appeared on publications touting its value for traditional chiropractic use—that is, finding subluxations—and this would have influenced many students and practitioners, perpetuating this paradigm of radiography. Despite the fact that no evidence of reconciliation between the two was found, Loban eventually accepted the boundary that B.J. Palmer set for chiropractic and worked to strengthen it.

The Hangover

Chittenden Turner wrote in his 1931 history of chiropractic that the X-ray was considered 'the original sin – the Mixer's first drink'.[78] However, it was the subluxation-based chiropractors that became advocates for unfettered radiography privileges. A subgroup of these practitioners still believes that these displacements are demonstrable on plain film radiographs. More than twenty subluxation-based chiropractic technique systems have adopted this paradigm, and most of those still exist at the time of this writing. They rely on radiographic analysis of subluxations as the main diagnostic[79] method and even, in most cases, as the main outcome measure by which they judge the success of their methods.[80] Because of this belief, this group tends toward over-utilisation of radiography.[81] Metaphorically, too much of a good thing has led to a 'hangover' that affects the entire profession. The inherent dangers of ionising radiation, though very small at diagnostic doses, have a public health implication. The use of the X-ray in support of the chiropractic subluxation helped lend credence to the notion of chiropractic as an unscientific cult.[82]

D.D., B.J., and many chiropractors since, were entrepreneurs in addition to health care providers. Since the earliest days of chiropractic, there has been a continuing proliferation of technique systems. Over one hundred named systems can be found, and although this is partly due to theoretical refinement, it is also partly an indication of entrepreneurship.[83] Entrepreneurship values marketing, and necessarily involves creativity and flexibility of thinking—qualities demonstrated by B.J. Palmer in his approach to diagnostic methods. Importantly however, this flexibility came with the caveat that any

method must fit his model of disease and treatment, which was central and necessarily rigid. There were three unchanging boundaries to B.J.'s health care ideology: First, the concept that 'Innate Intelligence' used mental impulses, carried by nerves, to direct the functions of the body; second, the ability of tiny displacements of vertebrae to interfere with the nerve transmission of these mental impulses; and third, that manipulation of vertebrae could remove this interference, and the consequent normalisation of body function would result in the restoration of health. Both D.D. and B.J. exhibited a progressive attitude to their profession, changing parts of chiropractic over time as they acquired new knowledge, developed new theories, or found new technologies. D.D.'s approach seems to have been theoretical. He continued to evolve his ideas of the mechanism of disease, but never the root aetiology; he maintained that ninety-five percent of disease was caused by subluxated vertebrae and the other five percent by subluxations of peripheral joints. He also never changed his method of diagnosis—manual palpation only—nor the cure for disease—i.e. adjusting subluxated joints. In contrast, B.J. was more practical. His desire to market chiropractic seems to have allowed him more leeway in altering the boundaries of the profession. The X-ray also served this purpose, bringing in the public to help boost converts to his method of healing. He augmented the numbers of people coming through the doors in October 1910 by opening his X-ray laboratory to the public for radiography of any condition. Prior to this it had only been for spinography for chiropractic analysis on patients attending the clinic at the school.[84]

Although still a staunch promoter of minute displacements of spinal bones as crucial to overall health, it seems that external forces eventually forced the pragmatic B.J. to change. In 1950, the Palmer School had had to give up teaching solely his HIO (Hole-in-One) theory[85] because Palmer School graduates were increasingly unable to pass state licensing board exams.[86] In addition, in 1958 a group of prominent and active chiropractors with an interest in radiology set up a radiology certification examination through the National Chiropractic Association's National Council on Chiropractic Roentgenology (NCCR). This group evolved to become the American Chiropractic College of Radiology (ACCR), an educational body, and the American Chiropractic Board of Radiology (ACBR), who administered the exam and certified chiropractic radiologists. These chiropractors emphasised the diagnostic use of X-ray imaging, but early on still acknowledged a role for chiropractic analysis.[87] Times

were changing around B.J., and he was forced, grudgingly perhaps, to give some ground towards the end. Chiropractic had grown to the point where one man could no longer set the boundaries for the majority.

B.J. Palmer seems to have gained major achievements for the chiropractic profession, though sometimes by promoting a spurious rationale. The primary example of this is the survival of the profession itself. It can be argued that without the influence of B.J., chiropractic would not exist as the independent profession that it is today. Attorney Tom Morris invented the 'separate and distinct' legal argument that helped win many cases of practicing medicine without a license that were brought against chiropractors in the early and mid-twentieth century. This argument based chiropractic wholly outside the sphere of medicine, as alternative rather than complementary.[88] Chiropractors did not 'diagnose', they 'analysed'. Chiropractors did not treat ailments, but rather 'adjusted' subluxations in order to allow the life force D.D. Palmer had coined as 'mental impulses' generated by the Innate Intelligence to flow through the nerves. The two main tools of medicine as B.J. Palmer saw them were drugs and surgery, and they were not part of chiropractic. Therefore a chiropractor could not be considered to be practicing medicine, because chiropractic concepts were completely different to those of medicine. B.J. Palmer then devoted considerable effort in travelling to testify in these cases, using Morris' argument, and was largely successful.[89] This was another aspect of Palmer's boundary work but is beyond the scope of this paper.

However as chiropractic exists today, many practitioners are not really separate and distinct, practicing using mainstream diagnostic methods and manual treatments that would not seem out of place in a physiotherapist's office. The boundary of using X-ray only to detect chiropractic subluxations has been abandoned by a majority of chiropractors. The idea of the chiropractic subluxation as the cause of disease, and its demonstrability on radiographs has little evidence to support it.[90] However, evidence-based chiropractors and the small group of the specialists known as chiropractic radiologists[91] have been shown to be adept at using radiographs to detect genuine pathology.[92] This has undoubtedly led to diagnoses of serious conditions for patients who have chosen to attend chiropractors rather than medical doctors. This is a positive effect of B.J.'s introduction of the technology to the profession. In fact, all chiropractors are trained in radiology and radiography skills. Accreditation bodies require it

for chiropractic teaching institutions worldwide.[93] Yet, anecdotally at least, B.J. Palmer is rarely given credit in those institutions or by evidence-based chiropractors for his role in securing this modality for the profession. Several chiropractic radiologists have authored textbooks on mainstream diagnostic imaging, describing the findings of musculoskeletal pathology as is seen in medical radiological pathology texts. In the introductory chapters of their books, Yochum and Rowe,[94] Sherman and Bauer,[95] and Marchiori[96] all devoted some space to the history of radiology. None mentioned B.J. Palmer's role in the adoption and early promotion of the technology in the profession, which is a significant omission. Perhaps some or all of them are simply unaware of B.J.'s impact in this regard, or perhaps they chose not to acknowledge it. It is also possible that they could not verify B.J. as the person to introduce the technology to the profession and so they chose not to mention it. As far as the authors are aware, this paper is the first attempt at verifying B.J. Palmer's claim that he initiated the use of X-ray in chiropractic. Whatever the case—whether through ignorance or intentional omission—the failure of these evidence-based chiropractors to acknowledge the significant contribution of B.J. Palmer, a subluxation-based chiropractor, could be characterised as contributing to the continuing schism in the profession. The deep separation between the evidence-based and subluxation-based chiropractors, differentiated in part by the subluxation paradigm of radiography, is perpetuated from both sides, and no solution seems forthcoming. Subluxation-based chiropractors continue to advocate for the traditional chiropractic use of radiography as B.J. Palmer first championed it, and evidence-based chiropractors have not acknowledged the pivotal action of B.J. Palmer's incorporation of the diagnostic technology into the profession, rather emphasising a professional and technical use of X-rays in their practice.

The various and moving boundaries erected by different chiropractors around their profession once led chiropractor Stanley Martin to joke: 'For every chiropractor there is an equal and opposite chiropractor'.[97] Subluxation-based paradigms of radiography exist at the time of this writing and can trace their lineages back to B.J. Palmer's boundary work. His reason for adopting the X-ray was solely for the visualisation of the chiropractic subluxation, but this boundary was unacceptable to some chiropractors and factions within chiropractic deepened and became consolidated. Both Palmers felt free to develop and change chiropractic as they wished, but B.J.'s adoption of the X-ray caused deep and permanent rifts between

practitioners and destroyed previously collegial relationships. Was it ego or was it a genuine conviction in his own theories? Although casual and anecdotal observations abound, as far as these authors are aware, there has not yet been a detailed forensic psychological analysis of B.J. Palmer; it could prove an interesting project. Without B.J. Palmer, chiropractic may not have had diagnostic imaging within its scope of practice, and chiropractic is unique in the complementary and alternative health care modalities in having the privilege of using X-ray.

Conclusion

The adoption of a medical technology by an alternative health care system, as chiropractic promoted itself at that time, seems paradoxical. However, the fact that X-ray was a medical tool was incidental to its chiropractic use, which was at first strictly for subluxation analysis. The adoption created a boundary that set chiropractic apart from other health care systems and lent it credibility in the new technological age that was budding. Chiropractors could 'prove' their concept of disease. But it reinforced divisions within the profession, driving purists to stand against its use, and therefore against B.J. Palmer. It also created new divisions between chiropractors who used it judiciously, for pathological diagnosis, and those who employed it more liberally, for subluxation analysis. These divisions continue today.

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1 Samuel Weed, Letter to D.D. Palmer naming chiropractic, 1896, copy of original mounted on wall at B.J. Palmer's winter residence in Sarasota, FL (viewed by the author 11 April 2013), 1.

2 Osteopaths in the United States utilise X-ray imaging; in that country, osteopaths are essentially the same as medical doctors. However, traditional osteopathic practice does not generally involve radiography.

3 In 1915 George V. Webster wrote about an early use of X-rays in osteopathy: 'The X-ray has repeatedly been able to present on the photographic plate a record of the faulty position of some of the ribs and vertebrae constituting an osteopathic lesion, when the same condition escaped the tactile sense of those not accustomed to spinal palpation. In numerous instances the X-ray has shown such parts in correct relationship after adjustment by osteopathic treatment. The X-ray, then, offers scientific proof of Osteopathy'. George V. Webster, "Scientific Proofs of Osteopathy", in his *Concerning Osteopathy* (Carthage, NY, USA: Rloyd J Rich Printer and Publisher, 1915), 101.

4 This is a fascinating story, and much has been written about it, but British radiologist James Brailsford related a particularly human and vivid account. James F Brailsford, "Roentgen's Discovery of X-rays: Their Application to Medicine and Surgery", *British Journal of Radiology* 19, no. 227 (1946): 453–61.

5 Joseph C. Keating, Jr., *B.J. Of Davenport: The Early Years Of Chiropractic* (Davenport, Iowa: Association for the History of Chiropractic, 1997), 68; Russell W. Gibbons and William S. Rehm, *Who's Who in Chiropractic, International*, 2nd ed. (Littleton, CO: Who's Who in Chiropractic International Publishing Co., 1980), 275. As a side note, different sources cite different years, varying from 1908 to 1911 as the one in which B.J. bought his X-ray machine. 1910 is used here because it is the most likely one in which the unit was set up and started producing radiographs according to contemporaneous newspaper reports and B.J.'s consistent retelling of the story. It matters little if the purchase order, or whatever paperwork was necessary for the acquisition, went through prior to that. 1911 seems unlikely given the reports in newspapers and newsletters.

6 Tal Golan, "The Emergence of the Silent Witness: The Legal and Medical Reception of X-rays in the USA", *Social Studies of Science* 34, no. 4 (2004): 469–99.

7 These areas, such as the torso and abdomen, did provide a technical challenge for early users of X-rays. The weak X-ray beam produced by the early equipment had difficulty penetrating them and patients had to lie perfectly still for half an hour or more in order to obtain an image. Even then, the images obtained would not be considered diagnostically acceptable today. But neither were the ones that B.J. Palmer claimed demonstrated chiropractic subluxations, if the reprints in his books are a reasonable representation of those images. By 1900 there were at least two hundred diagnostic X-ray installations in the United States, Britain, France, Germany, and Austria.

8 Tal Golan, "The Authority of Shadows: The Legal Embrace of the X-Ray", *Historical Reflections / Réflexions Historiques* 24, no. 3 (1998): 437–58.

9 Bettyann H. Kevles, *Naked to the Bone: Medical Imaging in the Twentieth Century,* (Reading, Massachusetts: Helix Books/Addison-Wesley, 1997), 67.

10 Thomas F. Gieryn, "Boundary-work and the Demarcation of Science from Non-Science: Strains and Interests in Professional Ideologies of Scientists", American Sociological Review 48, no. 12 (December 1983): 781–95.

11 D.D. Palmer founded chiropractic in 1895. B.J. Palmer, his son, dominated the profession in the early twentieth century. In order to avoid confusion between the two, instead of using their last names, the commonly invoked monikers D.D. for D.D. Palmer and B.J. for B.J. Palmer have been used in this paper.

12 Andrew T. Still, *Journal of Osteopathy* 5, no. 5 (1898): 212.

13 Andrew T. Still, **"**Infirmary Improvements", *Journal of Osteopathy* 5, no. 5 (1898) 259.

14 B.J. Palmer, *Our Masterpiece,* (Davenport, IA: Palmer College of Chiropractic, 1966), 14. *Our Masterpiece* claims that B.J. was the first chiropractor to use X-ray, the first person to use it in the City of Davenport and the first in State of Iowa.

15 These include: Keating, *B.J. Of Davenport*, 68; J. Stuart Moore, *Chiropractic In America: The History Of A Medical Alternative* (Baltimore: Johns Hopkins University Press, 1993), 62; Walter I. Wardwell, *Chiropractic: History And Evolution Of A New Profession* (St.

Louis: Mosby-Year Book, 1992), 186; Abiathar A. Dye, *The Evolution Of Chiropractic: Its Discovery And Development* (Philadelphia, PA, USA: A.A. Dye, 1939), 190; Pierre-Louis Gaucher-Peslherbe, *Chiropractic: Early Concepts in their Historical Setting* (Lombard, IL: National College of Chiropractic, 1993), 164; Chittenden Turner, *The Rise of Chiropractic* (Los Angeles: Powell Publishing, 1931), 267; Steven C. Martin, "Chiropractic and the Social Context of Medical Technology, 1895–1925", *Technology and Culture* 34, no. 4 (1993): 808–34.

16 The search included freenewspaperarchives.us (National Collections, North Eastern United States, The South, The MidWest States, Western States, and Special Collections) and the Library of Congress – Chronicling America. 43104 records containing "chiroprac" between the years 1895 and 1929 were returned. No articles or advertisements for X-ray services (or radiography, spinography, or roentgenography, or the roots of those words) involving chiropractors were found prior to B.J. Palmer's 1910 use of the imaging modality.

17 "Crowds Throng to School's Opening*", The Davenport Democrat and Leader* (Davenport, IA), 12 May 1910; "Large Crowds are at Second Opening", *The Davenport Democrat and Leader* (Davenport, IA), 20 May 1910; "Immense Crowd Despite Weather", *The Daily Times* (Davenport, IA), 20 May 1910, 7; J. Rutherford, "X-Ray Laboratory Finest in World", *The Daily Times* (Davenport, IA), 20 May 1910, 8; Unknown, "Thousands Visited the Palmer School", *The Davenport Democrat and Leader* (Davenport, IA), 29 June 1910. Courtesy Special Collections and Archives, Palmer College of Chiropractic.

18 C.B. Johnson, I.J. McKell, and Earnest A. Thompson, "Locating the Cause of Disease by X-Ray", *The Ogden Standard* (Ogden, UT), 22 October 1917.

19 Andrew P. Davis, who studied under D.D. Palmer, was an itinerant student, teacher, and entrepreneur. He studied medicine, osteopathy, ophthalmology, chiropractic, and iridology, started several schools, and invented several health care systems. One of those systems was called Davray, being an amalgamation of his surname with that of his business partner at the time, Allan Raymond. This system did use X-ray at least as early as 1912, but therapeutically, not diagnostically. Andrew P. Davis, *The Davray Neuropathic System*, (Battle Creek, MI: Davis College of Neuropathy and Ophthalmology, 1912). There is no mention of X-ray in his earlier books: Andrew P. Davis, *Osteopathy: A Drugless System of Healing* (Cincinnati, OH: Fred L Rowe, 1899); Andrew P. Davis *Neurology Embracing Neuro-Ophthalmology: The New Science for the Successful Treatment of all Functional Human Ills* (Cincinnati, OH: F.L. Rowe, 1905); Andrew P. Davis, *Neuropathy: A New Science of Drugless Healing Amply Illustrated and Explained* (Cincinnati, OH: F.L. Rowe, 1909); Andrew P. Davis, *Neuropathy Illustrated: The Philosophy and Practical Application of Drugless Healing* (Long Beach, CA: Graves and Hersey, 1915); Andrew P. Davis, *Neuropathy: A Drugless Healing Science* (Detroit, MI: Andrew P Davis, 1910); Andrew P. Davis, *Neuropathy: The Davray Neuropathic System of Treatment* (Los Angeles: Davis College of Neuropathy and Ophthalmology, 1912).

20 Palmer, *Our Masterpiece*, 14.

21 Dye, *Evolution Of Chiropractic*, 191.

22 *Ibid*.

23 B.J. Palmer, "Introduction of Spinography: Its Origin, Purpose, Field of Labor and Why", in *Chiropractic Spinography,* 2nd ed., by EA Thompson (Davenport, IA, USA: Palmer School of Chiropractic, 1919), 15.

24 Palmer, *Our Masterpiece*, 72 [emphasis in original].

25 Ruth Brecher and Edward M Brecher, *The Rays: A History of Radiology in the United States and Canada* (Baltimore: Williams and Wilkins, 1969), 15.

26 Various advertising artwork layouts and printed ads for X-ray equipment offered by the 'PSC Sales Department' are available for viewing at the Special Collections and Archives, Palmer College of Chiropractic.

27 Gaucher-Peslherbe, 164.

28 Palmer, "Introduction", in *Chiropractic Spinography*, 18 [emphasis in original].

29 B.J. Palmer, "Spinography", *The Chiropractor* 6, no. 3 (1910), 127 [emphasis in original].

30 B.J. Palmer, "Minutes of the UCA convention", *The Chiropractor* 6, no. 10 (1910): 77–130.

31 B.J. Palmer, "Introduction", in *Chiropractic Spinography*, 27.
32 *Ibid*.
33 Kevles, 81.
34 Kenneth J. Young, "Gimme that Old Time Religion: The Influence of the Healthcare Belief System of Chiropractic's Early Leaders on the Development of X-ray Imaging in the Profession", *Chiropractic & Manual Therapies* 22, no. 1 (2014).
35 Robin Canterbury, "Radiography and Chiropractic Spinography", in *Chiropractic: An Illustrated History*, edited by D. Peterson and G. Wiese (St. Louis: Mosby Year-Book, 1995), 301.
36 Palmer, "Introduction", in *Chiropractic Spinography*, 20.
37 B.J. Palmer Chiropractic Clinic, *Notes from the Clinic Desk: This Week in the Clinic—Regional Radiography* (Davenport, IA: Palmer College of Chiropractic, 1959).
38 Young, "Gimme that Old Time Religion".
39 Martin, "Chiropractic".
40 Young, "Gimme that Old Time Religion".",
41 Edzard Ernst "Chiropractors' use of X-rays", *British Journal of Radiology* 71, no. 843 (1998): 249–51.
42 Keating, *B.J. of Davenport,* 158–9.
43 Some of B.J.'s students internalised this attitude. Clarence Gonstead, who went on to found an eponymous subluxation-based chiropractic technique system, was quoted as saying: 'Remember that chiropractic always works. When it does not seem to, examine your application but do not question the principle'. This is written in an art deco type font B.J. particularly liked, on the wall of the current Palmer College of Chiropractic, along with other sayings from B.J., D.D., and various chiropractors the school considers notable, which are scattered throughout the buildings. (Viewed by the author 24 March 2015).
44 Initially, B.J. referred to the images as X-rays, X-ray photographs, or skiagraphs, as was the custom at the time (see B.J. Palmer, *The P.S.C Announcement 1910* (Davenport, IA: Palmer School of Chiropractic, 1910), 163–5). But very shortly thereafter, in February 1910, he announced that he had coined a new term for radiographs taken of the spine for chiropractic purposes: 'spinographs' (see B.J. Palmer, "Progress Again", *The Chiropractor* 6, no. 2 (February 1910): 52–4). Chiropractors would not perform radiography but rather spinography, which he marketed as part of the Palmer brand. Ads for the new technology used an analogy to photography, stating that as Eastman invented Kodak, Palmer invented the spinograph.
45 Karl Mannheim, *Ideology and Utopia* (London: Routledge & Kegan Paul Ltd, 1954), 67.
46 Clifford Geertz, *The Interpretation of Cultures* (New York: Basic,1973), 212.
47 B.J. Palmer, *Fame and Fortune and The Know-How and Show-How to Attain It* (Davenport, Iowa: Chiropractic Fountain Head, 1955).
48 W. Heath Quigley, "The Last Days of B.J. Palmer: Revolutionary Confronts Reality", *Chiropractic History* 9, no. 2 (1989): 11–19.
49 Bart N. Green, Claire D. Johnson, Todd Andrew, Peter Martin, "Improving Historical Research Reports: A Case Report Format and Example in Arden Zimmerman, D.C.", *Journal of Chiropractic Humanities* 8, no. 1, (1998): 43–54.
50 D.D. Palmer, *The Chiropractor's Adjuster: Textbook of the Science, Art and Philosophy of Chiropractic for Students and Practitioners* (Portland, Oregon: Portland Printing House Co., 1910).
51 Joseph C. Keating, Jr., "The Evolution of Palmer's Metaphors and Hypotheses", *Philosophical Constructs for the Chiropractic Profession* 2, no. 1 (1992): 9-19.
52 Palmer, *The Chiropractor's Adjuster*, 490. D.D. Palmer's books were large; this one was 1,007 pages and consisted largely of berating his former students, including Willard Carver, Andrew P. Davis, Solon Langworthy, Alva Gregory, John Howard, and his son B.J. Palmer. Using sarcastic titles like 'Friend Carver' and 'Uncle Howard', he went into painstaking detail to indicate their misunderstanding of anatomy, misinterpretation of physiology, and what he considered the adulterated version of chiropractic that they were advocating. The other major component of this book involved explanations of pathology, often quoting mainstream sources of the day. But his cure was always the same, removing nerve interference through replacing displaced bones.

53 His opinion on X-ray therapy was condescending and dismissive, but then so was much of the writing in his books.
54 Palmer, *The Chiropractor's Adjuster*, 490.
55 D.D. Palmer, "Nerve Vibration", *Progress Chiropractic* 1, no. 8–9 (1913): 34–6; Joseph C. Keating, Jr, "The Evolution of Palmer's Metaphors and Hypotheses", *Philosophical Constructs for the Chiropractic Profession* 2, no. 1 (1992): 9–19.
56 Palmer, *The Chiropractor's Adjuster*, 101.
57 *Ibid.*, 819.
58 *Ibid*.
59 Martin, "Chiropractic".
60 Russell W. Gibbons, "Physician-Chiropractors: Medical Presence in the Evolution of Chiropractic", *Bulletin of the History of Medicine* 55, no. 2 (1981): 233–45.
61 Gaucher-Peslherbe, 164.
62 Dye, *Evolution Of Chiropractic*, 192–3.
63 Another part of the story may lie in B.J.'s personality. Sadie Chamberlain, member of the PSC class of 1910 reported in an interview that the walkout may have been triggered by a 'final straw' comment of the type B.J. apparently repeatedly made during lectures, making fun of something in the Bible or a crude remark about women. Rolf E. Peters, "Letter to the Editor", *Chiropractic History* 19, no. 1 (1999), 5.
64 Palmer, "Progress Again". Loban simply said that he was leaving to go into private practice, and B.J. wished him well and praised his skills. But according to Loban's letter of resignation as assistant secretary of the Universal Chiropractors Association (which was also run by B.J.), the location of his private practice had yet to be been determined. This would seem to hint at a certain amount of unpreparedness for his departure from the PSC, as if B.J. and he had had a clash that damaged their relationship beyond repair. Joy M. Loban, *Letter of Resignation from the Universal Chiropractors Association*, 1910, Special Collections and Archives, Palmer College of Chiropractic.
65 Palmer, "Progress Again". It has been reported that James McGinnis was the PSC's first spinographer [see Joseph C. Keating, Jr, "James F. McGinnis, DC, ND, CP (1873–1947): Spinographer, Educator, Marketer and Bloodless Surgeon", *Chiropractic History* 18, no. 2 (1998): 63–79)] but he was in fact the third. Loban worked with B.J. taking and interpreting the first spinographs. After Loban left in early 1910, B.J. appointed C.R. McAdams to be in charge of the spinography department. [B.J. Palmer, "X-ray Laboratory Finest in World", *The Chiropractor* 6, no. 12 (1910): 25–6; B.J. Palmer, *The PSC Announcement 1911* (Davenport, IA: Palmer School of Chiropractic, 1911), 219.] McAdams was in the position through most of 1911. McGinnis was listed as the school photographer, and as such, developed the spinographs, which required essentially photographic skills at that time [B.J. Palmer, "The 1910 Success Article", *The Chiropractor* 7, no. 1 (January 1911): 2–12] and was announced as spinographer in 1912 [B.J. Palmer, *The Palmer School of Chiropractic Announcement 1912* (Davenport, IA: Palmer School of Chiropractic, 1912), 201.]
66 Loban wrote that certain adjunctive therapies were acceptable, because they helped patients feel better in the short term. These included massage, hydrotherapy, mechano-therapy, suggestive therapeutics, and osteopathy. This idea was anathema to B.J. Palmer. Loban did retain a ban on the use of drugs and electricity. He wrote ambiguously about adjuncts, too, though. Later in the book Loban states that adjuncts interfere with the chiropractic adjustment's ability to cure all disease. Joy M. Loban, *Technic and Practice of Chiropractic*, 1st ed. (Davenport, IA: Universal Chiropractic College, 1912), 182–5.
67 Joy M. Loban, "The Erect Spinograph", *Universal Chiropractic College Bulletin* 14, no. 6 (1924): 1–4. This is another example of two proponents of very similar systems arguing over fine points of difference, while still contending that the X-ray is only for subluxation analysis.
68 Pittsburgh College of Chiropractic, *Pittsburgh College Bulletin* 2, no. 12 (1918), 1.
69 Documents consulted included: Pittsburgh College of Chiropractic, *Second Annual Catalogue* (Pittsburgh, PA: Pittsburgh College of Chiropractic, 1914); Pittsburgh College of Chiropractic, *Pittsburgh College Bulletin* 1, no. 1 (1917); Pittsburgh College of Chiropractic, *Pittsburgh College Bulletin* 1, no. 2 (1917).

70 D.E. Richards and J.M. Lloyd, *Chiropractic* (Pittsburgh, PA: Pittsburgh College of Chiropractic, 1912); Pittsburgh College of Chiropractic, *Fourth Annual Announcement* (Pittsburgh, PA: Pittsburgh College of Chiropractic, 1917).

71 Joy M. Loban, *Technic and Practice of Chiropractic*, 2nd ed. (Davenport, IA: Universal Chiropractic College, 1915); Joy M. Loban, *Technic and Practice of Chiropractic*, 3rd ed. (Pittsburgh, PA: Loban Publishing Co, 1920); Joy M. Loban, *Technic and Practice of Chiropractic*, 4th ed. (Denver, CO: Bunn-Loban Publishing Co, 1928).

72 Some secondary sources state that this took place in 1918 [see Gibbons and Rehm, 281; Julius Dintenfass, *Chiropractic: A Modern Way to Health* (New York: Pyramid Publications, 1977), 68]. Though access to primary sources regarding UCC and PCC was found to be limited, we can surmise that the claim of an earlier use of the technology by Loban seems unlikely, given the fanfare of the 1924 announcement. Further evidence is given by the fact that the Universal Chiropractic College Catalogues from 1921–22 and 1923 refer to radiograph radiography as part of the course, but there is no mention of the upright position [see Universal Chiropractic College, *Catalogue* (Pittsburgh, PA: Universal Chiropractic College, 1921–22); Universal Chiropractic College, *Fourteenth Annual Catalog* (Pittsburgh, PA: Universal Chiropractic College, 1923)]. However, the 1924 Catalogue states 'Special attention is called to the fact that in the College X-ray laboratory, spinographs will now be taken with the patient in the erect posture which subjects the spine to its normal stresses' [Universal Chiropractic College, *Fifteenth Annual Catalog* (Pittsburgh, PA: Universal Chiropractic College, 1924), 16].

73 Loban, *Technic and Practice of Chiropractic.*

74 Russell W. Gibbons, "Joy Loban and Andrew Davis: Itinerant Healers and Schoolmen, 1910–1923", *Chiropractic History* 11, no. 1 (1991): 23–8.

75 B.J. Palmer, "Times Change Men" *Fountain Head News* 14, no. 9 (1924), 3.

76 Gaucher-Peslherbe, 164.

77 Russell W. Gibbons, "Physician-Chiropractors: Medical Presence in the Evolution of Chiropractic", *Bulletin of the History of Medicine* 55, no. 2 (1981), 233.

78 Turner, 206.

79 The word 'diagnostic' makes the sentence understandable to a wide audience, but subluxation-based chiropractors assert that they do not 'diagnose' or 'treat' conditions, but rather 'analyse' and 'correct' vertebral subluxations, allowing the body to heal itself.

80 Kenneth J. Young, "Evaluation of Publicly Available Documents to Trace Chiropractic Technique Systems That Advocate Radiography for Subluxation Analysis: A Proposed Genealogy", *Journal of Chiropractic Humanities* 21, no. 1 (2014), 1–24.

81 Carlo Ammendolia, Claire Bombardier, Sheilah Hogg-Johnson, and Richard Glazier, "Views on Radiography Use for Patients with Acute Low Back Pain among Chiropractors in an Ontario Community", *Journal of Manipulative & Physiological Therapeutics* 25, no. 8 (2002): 511–20; Neil Scheurmier and Alan C Breen, "A Pilot Study of the Purchase of Manipulation Services for Acute Low Back Pain in the United Kingdom", *Journal of Manipulative & Physiological Therapeutics* 21, no. 1 (1998): 14–18; Ernst, "Chiropractors' use of x-rays".

82 AMA House of Delegates, *Statement of Policy on Chiropractic* (American Medical Association, 1966); Herb Denenberg, "Chiropractic: Is it 'An Unscientific Cult?'", *Beaver County Times* (Beaver County, PA), 1975, A-7. The use of radiography for subluxation analysis has even contributed to bizarre legislation, like the change to the Social Security law in the United States in 1972, which allowed Medicare to reimburse chiropractors for manual manipulation to correct subluxations as demonstrated by radiograph, but did not reimburse for the radiographs themselves. United States Congress, "Social Security Amendments of 1972", *Public Law,* 92–603 (Washington, DC: United States Congress, 1972).

83 Thomas F. Bergmann, "Various Forms of Chiropractic Technique", *Journal of Chiropractic Technique* 5, no. 2 (1993): 53–5.

84 B.J. Palmer, "Public X-ray Work at Palmer School", *The Chiropractor* 6, no. 10 (1910): 49–50.

85 B.J. adopted his Hole-In-One (HIO) theory around 1930 as the new 'one cause one cure'. It contended that only the base of the skull and top two vertebrae could be truly subluxated.

The odontoid process was the 'one' in the 'hole' of the atlas. All teaching at the PSC focussed on this, and special radiographic views were invented to quantify apparent misalignments of these bones. A number of derivative technique systems arose from this theory, and most are still practiced at the time of this writing (2015–16).

86 W. Heath Quigley, "The Last Days of B.J. Palmer: Revolutionary Confronts Reality", *Chiropractic History* 9, no. 2 (1989): 11–19.

87 Kenneth J. Young and Joseph C. Keating, Jr, "Waldo G. Poehner, DC, DACBR: A Force for Progressiveness", *Chiropractic History* 29, no. 1 (2009): 9–15.

88 Francis James Howitt Wilson discusses the distinction between 'complementary' and 'alternative' health care in his thesis: "The Origins and Professional Development of Chiropractic in Britain" (PhD thesis, University of Southampton, 2012.

89 Joseph C. Keating, Jr, "Tom Morris, Defender of Chiropractic, Part I", *Dynamic Chiropractic* 17, no. 25 (1999), available online at: http://www.dynamicchiropractic.com/mpacms/dc/article.php?id=36393 (accessed 8 June 2016); Joseph C. Keating Jr, "Tom Morris, Defender of Chiropractic, Part II", *Dynamic Chiropractic* 18, no. 2 (1999), http://www.dynamicchiropractic.com/mpacms/dc/article.php?id=31501 (accessed 8 June 2016).

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93 Stanley I. Innes, Charlotte Leboeuf-Yde, and Bruce Walker, "Similarities and Differences of Graduate Entry-level Competencies of Chiropractic Councils on Education: A Systematic Review", *Chiropractic and Manual Therapies* 24, no. 1 (2016).

94 Terry R. Yochum and Lindsay J. Rowe, *Yochum And Rowe's Essentials Of Skeletal Radiology* (Philadelphia: Lippincott/Williams & Wilkins, 2005), xxxix.

95 Raymond Sherman and Felix Bauer, *X-ray X-pertise—from A to X* (Fort Worth, TX: Parker Chiropractic Research Foundation, 1982), 1–2.

96 Robert Percuoco, "Plain Radiographic Imaging", in *Clinical Imaging: With Skeletal, Chest and Abdomen Pattern Differentials,* edited by D. Marchiori (St. Louis: Elsevier Health Sciences, 2004), 3.

97 Joseph C. Keating Jr, "The Meanings of Innate", *Journal of the Canadian Chiropractic Association* 46, no. 1 (2002): 4–10.