

DOCKET NO: 0286868-00188
'896 PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

PATENT: 7,806,896

INVENTOR: PETER M. BONUTTI

FILED: NOV. 25, 2003

ISSUED: OCT. 5, 2010

TITLE: KNEE ARTHROPLASTY
METHOD

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**DECLARATION OF JAY D. MABREY, MD, MBA REGARDING
U.S. PATENT NO. 7,806,896**

I, Jay D. Mabrey, declare as follows:

1. My name is Jay D. Mabrey.
2. I received a B.A. in Biochemistry from Cornell University in 1977 and an M.D. from Weill Cornell Medical College in 1981. I also received an M.B.A. from Texas Woman's University in 2012.
3. I served as an Intern in General Surgery in 1981, as a Resident in General Surgery in 1982, as a Resident in Orthopaedics from 1983 to 1986, and as

Chief Resident in Orthopaedics in 1987, all at Duke University Medical Center in Durham, North Carolina. I additionally completed a Fellowship in Biomechanics and Total Joints at the Hospital for Special Surgery in New York, New York, in 1991.

4. I received certifications from the National Board of Medical Examiners in 1982 and from the American Board of Orthopaedic Surgery in 1989. I was recertified by the American Board of Orthopaedic Surgery (Oral) in 1998 and by the American Board of Orthopaedic Surgery (Computer) in 2010. I have held a permanent license to practice medicine in Texas since 1992.

5. My areas of expertise include orthopedic surgery, including knee and hip replacement, medical device design, and computer assisted surgery. As described in my *curriculum vitae* (CV), attached as Appendix A, I have extensive experience related to performing knee replacement surgeries, as well as designing medical devices for knee replacement surgery.

6. I have held several academic appointments, including serving as the Chief of the Department of Orthopaedics Baylor University Medical Center in Dallas, Texas since 2004 and serving as a Professor of Surgery at Texas A&M Health Science Center College of Medicine in Bryan, Texas since 2012. A

complete list of my academic appointments is included in my CV, attached as Appendix A.

7. I have extensive industry experience consulting on the design of medical devices, including work for Exactech on computer assisted navigation systems, for DePuy on Surgical Robotics, and for Howmedica and Smith & Nephew on Adult Reconstruction. I have also worked as a surgeon as part of my service in the Army Reserve. A complete list of my civilian and military experience is included in my CV, attached as Appendix A.

8. I have authored or co-authored numerous peer-reviewed academic publications in the field of orthopedic surgery, including Mabrey JD, Toohey JS, Armstrong DA, Lavery L, Wammack LA: "Clinical pathway management of total knee arthroplasty," Clinical Orthopaedics and Related Research, Vol 345: pp 125-133, December, 1997 and Covall DJ, Stulberg BN, Mabrey JD, Burstein AH, Angibaud LD, Smith K, Zadzilka JD: "Introducing a New Technique for Improving Predictability in Cruciate Retaining Total Knee Arthroplasty: The Posterior Cruciate Referencing Technique." Techniques in Knee Surgery. 8(4):271-275, December 2009. A complete list of my publications is included in my CV, attached as Appendix A.

9. I am a named co-inventor on U.S. Patent Nos. 8,414,653 and 8,506,640, both related to a knee prosthesis system.

10. I have served as a panelist on the FDA Orthopaedic Devices Panel from 2004 to 2006 and then served as the Panel's Chairman from 2006 through 2010.

11. I have reviewed the specification and claims of U.S. Patent No. 7,806,896 (the "'896 patent" (Ex. 1001)). I have been informed that the '896 patent was filed Nov. 25, 2003, and was a continuation of U.S. patent application Ser. No. 10/191,751 filed Jul. 8, 2002 now U.S. Pat. No. 7,104,996 and a continuation-in-part of the following applications: U.S. patent application Ser. No. 09/976,396 filed Oct. 11, 2001 now U.S. Pat. No. 6,770,078; U.S. patent application Ser. No. 09/941,185 filed Aug. 28, 2001 now U.S. Pat. No. 6,702,821; U.S. patent application Ser. No. 09/566,070, filed May 5, 2000, now U.S. Pat. No. 6,575,982; U.S. patent application Ser. No. 09/737,380 filed Dec. 15, 2000 now U.S. Pat. No. 6,503,267; U.S. patent application Ser. No. 09/569,020 filed May 11, 2000 now U.S. Pat. No. 6,423,063; U.S. patent application Ser. No. 09/483,676 filed Jan. 14, 2000 now U.S. Pat. No. 6,468,289; U.S. patent application Ser. No. 09/798,870 filed Mar. 1, 2001 now U.S. Pat. No. 6,503,277; U.S. patent application Ser. No. 09/526,949 filed on Mar. 16, 2000 now U.S. Pat. No.

6,620,181; U.S. patent application Ser. No. 09/789,621 filed Feb. 21, 2001 now U.S. Pat. No. 6,635,073. *See* '896 patent, at cover page (Ex. 1001). I understand that the earliest effective filing date of Claims 1 and 13 of the '896 patent is November 25, 2003. I further understand that even if Applicant asserts the effective filing date is August 28, 2001, the filing date of U.S. Pat. No. 6,702,821, challenged in a separate petition, the references are still prior art.

12. I have also reviewed the following references:

- Scott L. Delp, *et al.*, "Computer Assisted Knee Replacement," Clinical Orthopaedics and Related Research, No. 354, pp. 49-56 (1998) ("Delp Article" (Ex. 1003)), which has a publication date of 1998, and is prior art to the '896 patent under 35 U.S.C. § 102(b).
- U.S. Patent No. 5,871,018 ("Delp '018" (Ex. 1004)), which has a filing date of June 6, 1997, and an issue date of February 16, 1999, and is prior art to the '896 patent under 35 U.S.C. § 102(b).
- S. David Stulberg, *et al.*, "Computer-Assisted Total Knee Replacement Arthroplasty," 10(1) Operative Techniques in Orthopaedics, pp. 25-39 (Jan. 2000) ("Stulberg" (Ex. 1005)), which has a publication date of Jan. 2000, and is prior art to the '896 patent under 35 U.S.C. § 102(b).

- International Patent Application Publication No. WO 93/25157 (“Radermacher ’157” (Ex. 1007)), which has an international filing date of June 17, 1993, and an international publication date of December 23, 1993, and is prior art to the ’896 patent under 35 U.S.C. § 102(b).
- Klaus Radermacher, *et al.*, “Computer Assisted Orthopaedic Surgery With Image Based Individual Templates,” 354 Clinical Orthopaedics and Related Research, pp. 28-38 (1998) (“Radermacher Article” (Ex. 1006)), which has a publication date of 1998, and is prior art to the ’896 patent under 35 U.S.C. § 102(b).
- Roderick H. Turner, Richard Matzan, and Yousif I. Hamati, “Geometric and Anametric Total Knee Replacement,” in Total Knee Replacement (A.A. Savastano, M.D. ed. 1980) (“Turner” (Ex. 1008)), which has a publication date of 1980, and is prior art to the ’896 patent under 35 U.S.C. § 102(b).
- Striker Howmedica Osteonics, “Scorpio Single Axis Total Knee System: Passport A.R. Surgical Technique” (“Scorpio” (Ex. 1009)), which has a publication date of May 2000, and is prior art to the ’896 patent under 35 U.S.C. § 102(b).

13. I am being compensated at my normal consulting rate for my work. My compensation is not dependent on and in no way affects the substance of my statements in this Declaration.

14. I have no financial interest in Petitioner. I similarly have no financial interest in the '896 patent, and have had no contact with the named inventor of the '896 patent.

Claim Construction

15. I have been informed and understand that the terms of the claim must be given their broadest reasonable interpretation. Based on that information and understanding, I agree with and have applied the following broadest reasonable interpretation of the claim term below to my analysis contained in this declaration:

16. The term “cutting guide” should mean a “guide that has a guide surface” and that the term “guide surface” should mean “a surface that guides a cutting instrument.” This definition is consistent with the '896 patent's specification. *See, e.g.*, '896 patent, col. 38, ll. 9-18 (Ex. 1001).¹

¹ I understand that this claim construction is appropriate under the “broadest reasonable construction” standard applied at the U.S.P.T.O. and does not indicate what claim construction would be appropriate in a District Court proceeding.

17. The term “customized cutting guide” should mean “a cutting guide modified for a specific patient.” This definition is consistent with the ’896 patent’s specification. *See* ’896 patent, col. 108, ll. 19-21 (Ex. 1001).

Background of the Technology

18. The challenged claims of the ’896 patent relate to methods for knee replacement surgery, also known as knee arthroplasty.

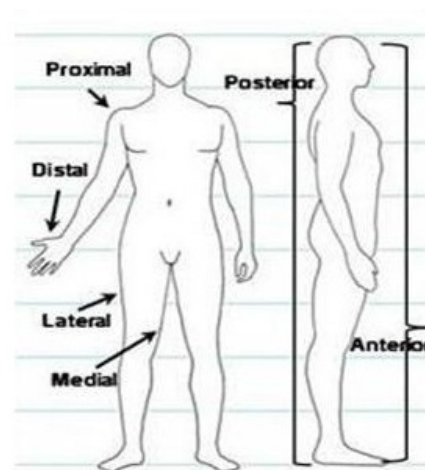
19. Generally, there are two types of knee replacement surgeries: total knee and partial knee replacement. During either type of knee replacement, an orthopedic surgeon replaces either a portion of or all of a damaged knee with an artificial device (also known as a prosthesis or an implant). Although a total knee arthroplasty (“TKA”) is the most common procedure, some people can benefit from replacing only a portion of the knee, such as the medial femoral-tibial joint. This partial replacement is sometimes called a unicondylar knee arthroplasty (“UKA”).

20. Knee replacement was not new when the ’896 patent was filed. Some elementary background in the anatomical terms of location, the knee anatomy, and the surgical procedure is helpful to understand fully the claim limitations in the challenged claim and to appreciate how the prior art renders the claim unpatentable.

Anatomical Terms of Location

21. The following standard anatomical terms are relevant to knee replacement:

- *Anterior* – Front of the body
- *Posterior* – Rear of the body
- *Medial* – Toward the center of the body
- *Lateral* – Left and right of the body
- *Proximal* – End of an appendage closer to torso
- *Distal* – End of an appendage further from torso



Relevant Knee Anatomy

22. At a simple conceptual level, the knee works like a modified hinge on a door. Bending of the knee is called “flexion” and straightening of the knee is called “extension.” The knee is more complex than a simple hinge and actually rotates around its central axis as it flexes and extends.

23. The knee is a major weight-bearing joint that is held together by muscles, ligaments, and soft tissue. Cartilage inside the joint provides shock absorption, which is used to walk, run, lift, climb stairs, etc. The illustration below shows the components of the knee:



Illustration of Components of Human Knee

24. A human knee is comprised of four main components: bones, ligaments, cartilage, and tendons.

25. *Bones* - A knee is made up of the thighbone (femur), the shinbone (tibia), the fibula, and the kneecap (patella). The thighbone and shinbone come together to form a hinge. The kneecap rests in front of this hinge to provide protection, but is not connected to the joint itself. Instead, the back of the kneecap (called the articulating surface) sits in a groove in the thighbone that allows the thighbone to rotate as the patella slides in this groove. When the knee bends or

straightens, the patella slides through that groove. This groove is sometimes called the femoral groove, the patellar groove, or the trochlear groove. The end of the thigh bone has two rounded areas called condyles, which glide against the cartilage of the shin bone. Two major supporting ligaments of the knee are the medial and lateral collateral ligaments. They attach to the medial and lateral femoral epicondyles. The epicondyles serve as reference points for positioning total knee implants during surgery. The features are shown below:

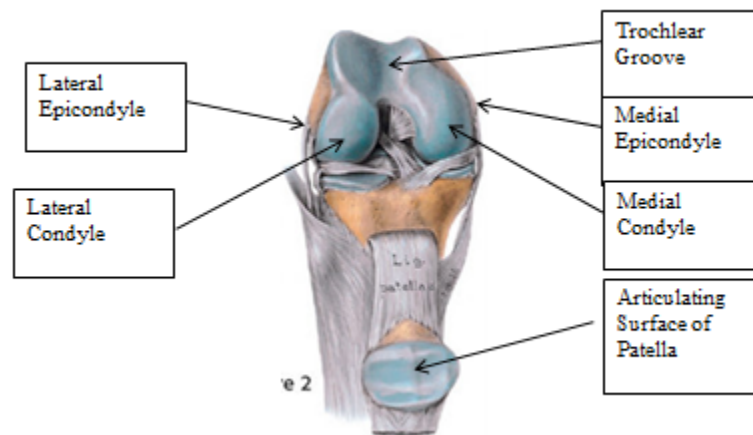


Illustration of Bent Knee with Patella Cut Away from Thighbone

26. *Ligaments* - Ligaments hold the components of the knee together and keep them stable.

27. *Cartilage* – Cartilage act as shock absorbers and low friction surfaces so that the bones can easily rotate.

28. *Tendons* - Tendons connect muscle to the knee bones.

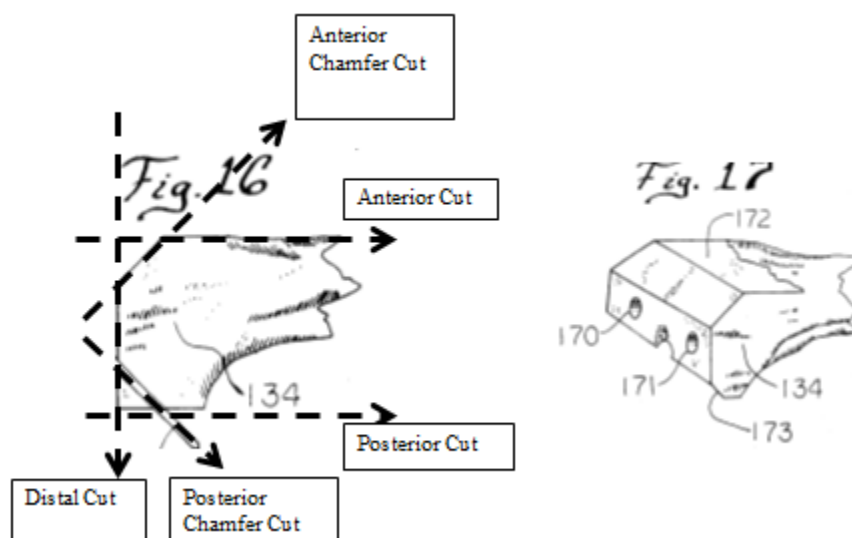
Knee Replacement Surgery

29. When a knee has been damaged by a disease like osteoarthritis, knee replacement surgery can replace the damaged portions with artificial components. Before the surgeon can begin the procedure, however, the parts of the knee to be replaced must be exposed. A surgeon will expose the operative areas by first making an incision through the patient's skin. The surgeon will then typically access the operative area by moving the patella out of the trochlear groove to expose the condyles and the intercondyle notch. The surgeon offsets the patella to the side of the knee by either pushing it over (displacing it laterally) without flipping it over, or by lifting the patella off of the knee and rotating it to the side such that the articulating surface is no longer facing the femur (referred to as everting). Once the surgeon offsets the patella, unless she is resurfacing the patella (described below), the surgeon will maintain the patella in the offset position, so that she has access to the bones of the knee during the surgery.

30. Once the knee is exposed, the surgeon will conduct the replacement through four phases: preparing the bone; positioning the implant; resurfacing the patella; and inserting a spacer.

31. *Preparing the Bone* – The surgeon removes the damaged cartilage surfaces at the ends of the femur and tibia and a small amount of underlying bone.

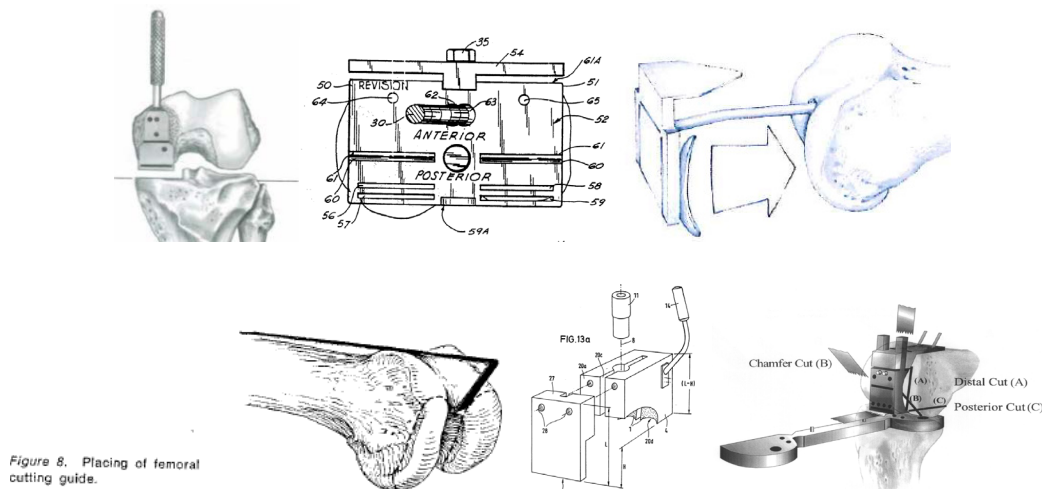
The figures below show an example of the cuts a surgeon would typically make to a femur during surgery and the results of those cuts.



Illustrations of Knee Resection Cuts (Fig. 16) and Resected Knee (Fig. 17)

U.S. Patent No. 4,502,483, filed March 9, 1983 (“Lacey ’483”), Figs. 16 & 17 (Ex. 1013)).

32. To help ensure that cuts are made accurately, surgeons typically use cutting guides with a guide surface that guides the saw used to cut (or “resect”) the bone. Cutting guides, also known as resection guides or guide members, come in many different shapes and sizes. A few illustrative examples of prior art cutting guides are shown below:



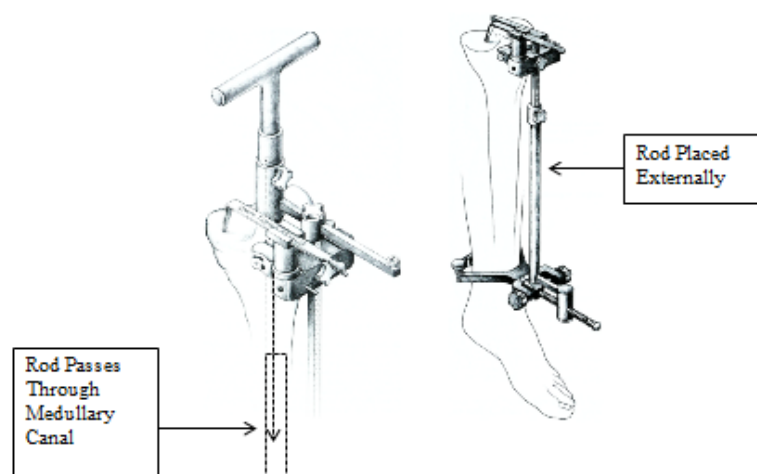
Illustrative Examples of Prior Art Cutting Guides

Smith & Nephew Genesis Uni, p. 16; Figs. 29 (Ex. 1018) (top left); Lackey '803, Fig. 11 (Ex. 1019) (assigned to Smith & Nephew Richards) (top center); Richards, p. 3 (Ex. 1020) (top right); Turner, Fig. 8; p. 181 (Ex. 1008) (bottom left); Radermacher '157, Fig. 13a (Ex. 1007) (bottom center); Keblish, Fig. 10 (Ex. 1021) (bottom right).

33. As shown above, in some cutting guides, such as the Smith & Nephew Genesis Uni, the guide surface is a slot. In other cutting guides, such as the Turner example, the cutting surface is provided without a slot. Other cutting guides, such as the Radermacher example, contain open guide surfaces (*e.g.*, 20b) and a slot (*e.g.*, 20c). Whether a slot is used is a matter of surgeon preference. Some surgeons prefer cutting guides with slots, which provide greater guidance of the saw blade, whereas other surgeons prefer open cutting surfaces, which are easier to

clean, generate less metallic debris, and make it easier for the surgeon to adjust the cut. The design choice between slots and open cutting guides was within the level of ordinary skill to design and modify when the '896 patent was filed. The placement and extent of the cutting surface is also within the level of ordinary skill. Each had known attributes and predictable results.

34. Initially, surgeons positioned cutting guides by hand. Beginning in the 1960's and 1970's, surgeons started using mechanical alignment guides to assure that cutting guides were properly aligned with the leg when placed on the bone. Two common types of alignment guides are intramedullary alignment rods, which are inserted into the medullary canal (bone marrow cavity) of the bone and extramedullary alignment rods, which are placed externally along the medullary canal of the bone.



Illustrations of an Intramedullary Alignment Device (Left) and an Extramedullary Alignment System (Right)

Stulberg, p. 32, Figs. 10-11 (Ex.1005).

35. More recently, during the 1990's, surgeons began using computer assisted techniques to guide the placement of cutting blocks and create customized cutting guides adapted to fit a specific patient's bone.

36. *Positioning the Metal Implants* – The surgeon replaces the removed cartilage and bone with metal components that recreate the surface of the joint. Before implanting a metal implant, the surgeon will typically test the fit of the implant with a trial prosthesis that is the same size as the metal implant, but is not implanted. After confirming the fit with the trial prostheses, the metal implants may be cemented or “press-fit” into the bone.

37. *Resurfacing the Patella* – In some circumstances, the surgeon cuts and resurfaces the undersurface of the patella (kneecap) with a plastic button.

38. *Inserting a Spacer* – The surgeon inserts a medical-grade plastic spacer between the metal components to create a smooth gliding surface.

39. Once the surgeon has completed these four phases of the knee replacement surgery, she will place the various components of the now-updated knee into their original positions. This includes moving the patella back into the replaced trochlear groove. She will then perform various tests to assure that the knee has the proper functionality and mobility, and close the incision.

Computer Assisted Knee Surgery

40. Computer-assisted knee replacement was not new when the '896 patent was filed.² One approach developed in the 1990's uses preoperative scanning techniques (*e.g.*, MRI, CT-scan, etc.) to visualize an individual patient's bony knee anatomy. Other systems utilize bony landmarks and centers of rotation acquired at the time of surgery to establish proper axes of alignment. These techniques permit the surgeon to identify important landmarks that ensure that the implants are properly installed. In addition, those techniques that utilize scans can be used to create customized cutting blocks that interface precisely with the patient's bony anatomy and ensure accurate placement of the implants. These were developed due to the failings of standard mechanical techniques:

Mechanical alignment systems have fundamental limitations that limit their ultimate accuracy. The accuracy of preoperative planning is limited by the errors inherent to standard radiographs. With standard instrumentation, the correct location of crucial alignment landmarks . . . is limited during the performance of a TKR
[M]echanical alignment and sizing devices presume a standardized

² The '896 patent acknowledges image guided surgery systems were "known" and "commercially available." *E.g.*, '896 patent, col. 42, ll. 30-39 (Ex. 1001).

bone geometry that may not apply to a specific patient. Even the most elaborate mechanical instrumentation systems rely on visual inspection to confirm the accuracy of the limb and implant alignment.

Stulberg, p. 25 (Ex.1005). Computer-based systems were designed to address these problems, Stulberg, p. 25 (Ex.1005), and were designed with standard instruments and implants in mind. Stulberg, p. 33 (Ex.1005). For example, the computer-assisted knee replacement technique discussed in 1999 in Stulberg “uses currently available mechanical total knee instruments” with the disclosed computer-assisted alignment techniques. *Id.*, p. 33 (Ex. 1005).

41. Beyond alignment, computer-assisted surgery was used for customizing cutting blocks. The Radermacher Article, published in 1998, describes development of individual templates based on a patient’s CT-scan that are “customized on the basis of. . . the bone structures.” Radermacher Article, p. 29 (Ex. 1006). This system “facilitates exact, safe, and fast implementation of planned surgery on bone structures, [and] eliminates the need for continual radiographic monitoring.” *Id.*(Ex. 1006).

The '896 Patent

42. The challenged claims of the '896 patent merely recite conventional techniques and instrumentation for performing knee surgery. Challenged claims 1 and 13 are reproduced below:

1. A method of replacing at least a portion of a patient's knee, the method comprising the steps of:
 - (a)³ making an incision in a knee portion of a leg of the patient;
 - (b) determining a position of a cutting guide using references derived independently from an intramedullary device;
 - (c) positioning a cutting guide using the determined position, passing the cutting guide through the incision and on a surface of a distal end portion of an unresected femur, the cutting guide secured to the bone free of an extramedullary or intramedullary alignment rod;
 - (d) moving a cutting tool through the incision into engagement with a guide surface on the cutting guide; and
 - (e) forming at least an initial cut on the femur by moving the cutting tool along the guide surface;
 - (f) attaching a replacement portion of the knee to the cut surface, the replacement portion having a transverse dimension that is larger than a transverse dimension of the guide surface.

³ The identifiers (a), (b), etc. have been added to the limitations to facilitate discussion of the claims.

13. A method of replacing at least a portion of a joint in a patient, the method comprising the steps of:

- (a) obtaining a customized cutting guide fabricated for the patient based on preoperative information, the cutting guide positionable in a pre-determined position on a bone of the joint using references derived independently from an intramedullary device;
- (b) making an incision adjacent to the joint in the patient;
- (c) positioning the cutting guide in the pre-determined position by passing the cutting guide through the incision and on a surface of an end portion of an unresected bone of the joint;
- (d) moving a cutting tool through the incision into engagement with a guide surface on the positioned cutting guide;
- (e) cutting the unresected bone of the joint for the first time, by moving the cutting tool along the guide surface;
- (f) attaching a replacement portion of the knee to the cut surface, the replacement portion having a transverse dimension that is larger than a transverse dimension of the guide surface; and
- (g) disposing of the cutting guide, as it is no longer safely usable the bone for which it was custom fabricated having been cut and therefore changed.

'896 patent, claims 1 and 13, Ex. 1001.

43. As set forth in detail below, claims 1 and 13 do nothing more than describe and claim the conventional steps for performing a knee surgery using surgical techniques and instrumentation that was old and well-known as of the

earliest possible priority date of the '896 patent. *See* That is, prior to August 28, 2001, surgeons knew of and had performed a knee replacement with reduced-size instrumentation and no intramedullary or extramedullary guidance (Claim 1) and with a custom cutting guide placed without intramedullary guidance (Claim 13).

44. The background of the specification acknowledges that many of the claimed steps were known. *See* '896 patent, col. 1, l. 52 - col. 2, l. 38; col. 10, l. 25 - col. 11, l. 2 (Ex. 1001). The specification states that during a known total or partial knee replacement “an incision is made in a knee portion of the leg to obtain access to the knee joint” (making an incision, recited in claim 1, limitation (a), and claim 13, limitation (b)). '896 patent, col. 1, ll. 52-55 (Ex. 1001). The specification further states that the incision is made “to enable instrumentation, such as a femoral alignment guide, femoral cutting guide, anterior resection guide, distal resection guide, posterior and chamfer resection guide to be positioned relative to a distal end portion of the femur” (passing instrumentation through an incision, recited in claim 1, limitations (c) and (d), and claim 13, limitations (c) and (d)). '896 patent, col. 1, ll. 55-59 (Ex. 1001). The specification also states that “[c]uts are made on a femur and tibia” (cutting the bone, recited in claim 1, limitation (e), and claim 13, limitation (e)) and “implants [are] positioned in the knee portion of the patient’s leg” (attaching a replacement portion of the knee,

recited in claim 1, limitation (f), and claim 13, limitation (f)). '896 patent, col. 2, ll. 28-29; col. 10, l. 62 (Ex. 1001).

45. Of the 112 columns of material in the specification, only a few description paragraphs even arguably relate to the purportedly novel features of the claimed invention. For example, the specification states: “A cut on a bone in the patient may be completed using previously cut surfaces as a guide for the cutting tool.” '896 patent, col. 3, ll. 28-30 (Ex. 1001). During prosecution, Applicant appears to have relied—without explanation—on this disclosure for the conclusion that: “the present invention provides a means for cutting bone, where the guide member is free of extramedullary or intramedullary members.” '896 patent file history, April 30, 2007, Response, p. 13 (Ex. 1014).⁴

46. The specification also describes “computer navigation systems”:

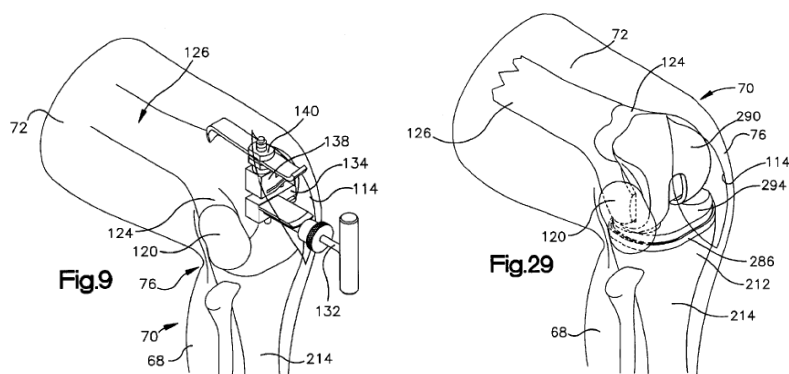
It is contemplated that emitters, receivers, and/or reflectors of computer navigation systems could be pinned or otherwise attached onto the femur 126 and tibia 214 to provide cutting positions and to

⁴ By contrast, the specification provides extensive description of “exemplary embodiment[s]” of the invention that disclose the opposite, namely, the use of intramedullary and extramedullary alignment devices. *E.g.*, '896 patent, col. 17, ll. 15-19; col. 103, ll. 37-39; Fig. 16 (showing “intramedullary rod 132”) (Ex. 1001).

facilitate ligament balancing through relatively small incisions. The computer navigation system may utilize three or four separate registers which have optical feedback to a central unit [and] may utilize electromagnetic or photo-optical feedback.

'896 patent, col. 36, ll. 55-58 (Ex. 1001). The specification acknowledges that image-guided surgery systems were “known” and “commercially available.” '896 patent, col. 42, ll. 30-39 (Ex. 1001).

47. The specification additionally describes “downsized instrumentation”:



[T]he femoral alignment guide 134 and anterior resection guide 138 have transverse dimensions, perpendicular to a longitudinal central axis of the femur 126, which are smaller than transverse dimensions of a femoral implant 290, tibial bearing insert 294, and a tibial tray 286 (FIG. 29) in a direction perpendicular to the longitudinal central axis of the femur 126 (FIG. 9).

'896 patent, Figs. 9, 29; col. 17, ll. 53-59 (Ex. 1001). The specification acknowledges that the instrumentation in Figure 9 (as well as in Figures 10 through

21), “with the exception of being down sized, is generally similar to known instrumentation which is commercially available . . . under the trademark ‘Scorpio’ single access total knee system.” ’896 patent, col. 36, ll. 61-65 (Ex. 1001).

48. The specification also notes that “customized instrumentation” is possible and discusses benefits associated with disposable instrumentation. ’896 patent, col. 108, ll. 19-26 (Ex. 1001).

The Prior Art That Renders The Challenged Claim Unpatentable

49. The challenged claims recite features long known by persons of skill in the art in the field of knee arthroplasty. The purported invention is a combination of known features, each of which was well known to those skilled in the art before and at the time to which the ’896 patent claims priority. As discussed in the grounds presented below, the claimed methods were known, the claimed steps performed in expected ways, and any benefit that the steps achieve was expected. Based on the prior art cited herein, the claimed limitations of the alleged invention perform known functions with an expected result, and are therefore unpatentable.

Delp Article

50. The Delp Article describes computer-assisted surgical systems developed to overcome problems with mechanical alignment systems. Delp

Article, pp. 49-56 (Ex. 1003). Computer-assisted systems can use “computer integrated instruments” that augment “mechanical instruments through the addition of measurement probes that can be used to locate joint centers, track surgical tools, and align prosthetic components.” *Id.*, p. 50 (Ex. 1003). The Delp Article explains that “[c]omputer integrated instruments that combine standard cutting guides with highly accurate measurement equipment are a natural extension of current techniques and offer several potential advantages.” Delp Article, p. 55 (Ex. 1003). In particular, the Delp Article explains that a computer-integrated instrument system “eliminates the need for intramedullary and extramedullary alignment guides.” Delp Article, p. 55 (Ex. 1003). Computer-assisted systems can also use “image guided knee replacement,” where a three-dimensional preoperative plan guides component placement. Delp Article, p. 50 (Ex. 1003). A person of ordinary skill in the art would understand from reading the Delp Article that a computer-assisted surgical system can use both computer-integrated instruments and image-guided knee replacement.

Delp '018

51. Delp '018 “relates generally to computer-assisted surgical systems, and in particular to a computer-assisted knee replacement system used to achieve accurate limb alignment with minimal surgical invasiveness.” Delp '018, col. 1, ll.

8-11 (Ex. 1004). Delp '018 aims “to provide a method of performing knee arthroplasty that does not require the use of an intramedullary rod in the femur.” Delp '018, col. 5, ll. 49-51 (Ex. 1004). It explains that the “invention overcomes alignment problems by determining optimal alignment preoperatively and using computer guidance to help the surgeon achieve this alignment.” Delp '018, col. 22, ll. 42-44 (Ex. 1004). Delp '018 further explains that the “computer replaces large, complicated mechanical alignment systems, allowing smaller jigs to be used, and thus a smaller incision to be made.” Delp '018, col. 22, ll. 45-47 (Ex. 1004).

Stulberg

52. Stulberg compares computer-assisted total knee replacement techniques with mechanically based techniques. Stulberg, p. 25 (Ex. 1005). For example, Stulberg explains that with a computer-assisted technique, the surgeon can track the position of the cutting block relative to the distal femur using a computer system, whereas with a “[m]echanical technique,” an “intramedullary rod is introduced into the femoral canal” to position the cutting block. Stulberg, pp. 30-31 (Ex. 1005).

Radermacher '157

53. Radermacher '157 discloses “individual templates” manufactured for specific patients based on preoperative imaging. Radermacher '157, pp. 9-10 (Ex.

1007). An individual template has a “negative image” of the unique structure of a specific patient’s bone so that it can be positioned on the bone “in a clearly defined position.” *Id.* An individual template can also have “guide means” for “cutting . . . steps” of an orthopedic surgery. *Id.*, p. 11 (Ex. 1007). Because an individual template has a negative image of a specific unique bone structure, it is positioned “without any further intraoperative devices” such as intramedullary and extramedullary devices. *Id.*, p. 15 (Ex. 1007). Individual templates can be used for “treatment of osseous [bone] structures for any orthopedic intervention,” including a knee arthroplasty. Radermacher ’157, pp. 11, 19 (Ex. 1007).

Radermacher Article

54. Radermacher Article describes a “technique for computerized tomographic image based preoperative three-dimensional planning and precise surgery on bone structures using individual templates.” Radermacher Article, p. 28 (Ex. 1006). Radermacher Article explains that “[i]ndividual templates are customized on the basis of three-dimensional reconstructions of the bone structures extracted from computerized tomographic (CT) image data in accordance with individual preoperative surgical planning.” Radermacher Article, p. 29 (Ex. 1006).

Turner

55. Turner discloses instruments and techniques for performing a TKA, including the “Geometric Total Knee.” *See* Turner, pp. 174-187 (Ex. 1008). Turner explains this TKA design has been used “since 1969.” Turner, p. 176 (Ex. 1008). As discussed in detail below, in Turner, the femoral cutting guide is substantially smaller than the implant.

Scorpio

56. Scorpio discloses “Surgical Technique” for a “Total Knee System.” Scorpio, cover page (Ex. 1009). The ’896 patent states embodiments of the invention, “with the exception of being down sized, [are] generally similar to known instrumentation which [is] commercially available . . . under the trademark ‘Scorpio’ single access total knee system.” ’896 patent, col. 35, ll. 61-65 (Ex. 1001). Moreover, as discussed below, the replacement portion is larger than the guide surface as required by claims 1 and 13.

**Technical Basis Underlying the Grounds of Rejections Set Forth in the
Petition for *Inter Partes* Review**

57. I now turn to the references applied in the grounds of rejections set forth in Section VIII of the Petition.

Independent Claim 1

58. Challenged claim 1 recites a method of replacing at least a portion of a patient's knee, the method comprising the steps of:

- (a) making an incision in a knee portion of a leg of the patient;
- (b) determining a position of a cutting guide using references derived independently from an intramedullary device;
- (c) positioning a cutting guide using the determined position, passing the cutting guide through the incision and on a surface of a distal end portion of an unresected femur, the cutting guide secured to the bone free of an extramedullary or intramedullary alignment rod;
- (d) moving a cutting tool through the incision into engagement with a guide surface on the cutting guide; and
- (e) forming at least an initial cut on the femur by moving the cutting tool along the guide surface;

(f) attaching a replacement portion of the knee to the cut surface, the replacement portion having a transverse dimension that is larger than a transverse dimension of the guide surface. ('896 patent, claim 1, Ex. 1001). Each of these steps of claim 1 are shown in the prior art.

**Claim 1 is Obvious over the Delp Article
in view of any one of Turner or Scorpio**

59. As shown in the summary chart below, claim 1 is rendered obvious by the Delp Article in view of any one of Turner or Scorpio.

60. The Delp Article discloses a method of replacing at least a portion of a patient's knee, as recited in the preamble. For example, the Delp Article is entitled "Computer Assisted Knee Replacement," which by definition addresses replacing at least a portion of a patient's knee. Delp Article, p. 49 (Ex. 1003).

61. The Delp Article discloses limitation (a), "making an incision in a knee portion of a leg of the patient." For example, Figure 1 of the Delp Article discloses a knee exposed by making an incision in the knee. Delp Article, p. 51 (Ex. 1003).

62. The Delp Article discloses limitation (b), "determining a position of a cutting guide using references derived independently from an intramedullary device." For example, the Delp Article discloses a computer-assisted system that

“displays the position of the cutting block relative to the desired position” and states that this system “eliminates the need for intramedullary and extramedullary alignment guides.” Delp Article, pp. 51, 55 (Ex. 1003).

63. Additionally, the Delp Article discloses that an “intraoperative system determines the position and orientation of the patient’s femur and tibia and guides the placement of the cutting jigs onto the bones.” Delp Article, pp. 51-52 (Ex. 1003). A person of ordinary skill in the art would understand that this system positions the cutting guide “using references derived independently from an intramedullary device” because it was “developed to overcome the problems with mechanical alignment systems” and because it uses image-guided alignment instead of an intramedullary device. Delp Article, p. 50 (Ex. 1003).

64. The Delp Article discloses limitation (c), “positioning a cutting guide using the determined position, passing the cutting guide through the incision and on a surface of a distal end portion of an unresected femur, the cutting guide secured to the bone free of an extramedullary or intramedullary alignment rod.” For example, the Delp Article discloses that a “computer workstation displays the position of the cutting block relative to the desired position . . . [and] [o]nce a jig is oriented properly it is secured in position,” which the Delp Article discloses can be

on a surface of a distal end portion of an unresected femur. Delp Article, p. 51 (Ex. 1003). Additionally, the Delp Article discloses an “intraoperative system [can] determine[] the position and orientation of the patient’s femur and tibia and guides the placement of the cutting jigs onto the bones.” Delp Article, pp. 51-52 (Ex. 1003). A person of ordinary skill in the art would understand that the Delp Article discloses “passing the cutting guide through the incision” because it discloses “secur[ing] [the cutting block] in position” on the bone and “placement of the cutting jigs onto the bones.” Delp Article, pp. 51-52 (Ex. 1002). Further, the cutting guide is “secured to the bone free of an extramedullary or intramedullary alignment rod” because the Delp Article’s disclosure explicitly “eliminates the need for intramedullary and extramedullary alignment guides,” and because it discloses systems “developed to overcome the problems with mechanical alignment systems.” Delp Article, pp. 50, 55 (Ex. 1002). To the extent the Patent Owner asserts that the Delp Article does not disclose “passing the cutting guide through the incision,” this requirement additionally would be clear to a person of ordinary skill in the art reading the Delp Article because doing so is a routine step during a knee surgery.

65. The Delp Article discloses limitation (d), “moving a cutting tool through the incision into engagement with a guide surface on the cutting guide.”

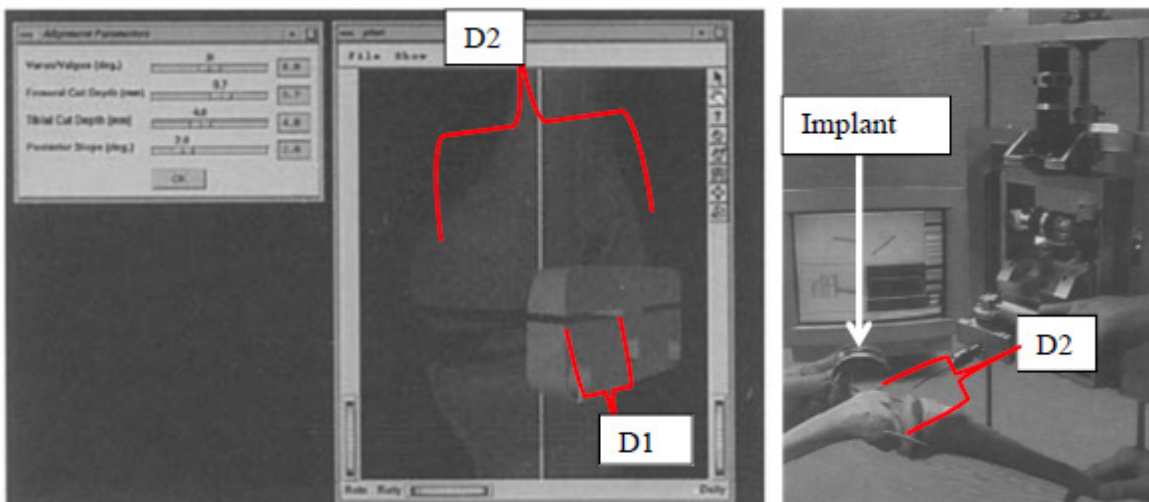
For example, the Delp Article discloses “[o]nce a jig is oriented properly it is secured in position and the cuts are made with a standard oscillating saw.” Delp Article, p. 51 (Ex. 1003). A person of ordinary skill in the art would understand this discloses limitation (d) because a standard oscillating saw (“cutting tool”) is moved through the incision into engagement with a guide surface on the cutting guide in order for “the cuts [to be] made with a standard oscillating saw” and a cutting “jig.” Additionally, the Delp Article discloses an “intraoperative system is used . . . to guide the surgeon in the placement of the cutting jigs so that the resections specified in the preoperative plan can be made.” Delp Article, p. 52 (Ex. 1003). A person of ordinary skill in the art would understand this discloses limitation (d) because a cutting tool is moved through the incision into engagement with a guide surface on the cutting guide in order for the surgeon to use the “cutting jigs” to make the “resections specified in the preoperative plan.” To the extent the Patent Owner asserts that the Delp Article does not disclose limitation (d), this limitation additionally would be clear to a person of ordinary skill in the art reading the Delp Article because moving a cutting tool through an incision into engagement with a cutting guide is a routine surgical step for cutting the bone.

66. The Delp Article discloses limitation (e), “forming at least an initial cut on the femur by moving the cutting tool along the guide surface.” For

example, the Delp Article discloses “[o]nce a jig is oriented properly it is secured in position and the cuts are made with a standard oscillating saw.” Delp Article, p. 51 (Ex. 1003). A person of ordinary skill in the art would understand this discloses limitation (e) because making “the cuts . . . with a standard oscillating saw” and a “jig” involves forming at least an initial cut on the femur by moving a standard oscillating saw (“cutting tool”) along the guide surface of the jig. Additionally, the Delp Article discloses an “intraoperative system is used . . . to guide the surgeon in the placement of the cutting jigs so that the resections specified in the preoperative plan can be made.” Delp Article, p. 52 (Ex. 1003). A person of ordinary skill in the art would understand this discloses limitation (e) because using the “cutting jigs” to make the “resections specified in the preoperative plan” involves forming at least an initial cut on the femur by moving the cutting tool along the guide surface.

67. The Delp Article in combination with Turner or Scorpio discloses limitation (f), “attaching a replacement portion of the knee to the cut surface, the replacement portion having a transverse dimension that is larger than a transverse dimension of the guide surface.” For example, the Delp Article discloses systems that can “align prosthetic components [implants]” and “guide[] the placement of the components [implants]” to replace the cut surface of the knee. Delp Article, p.

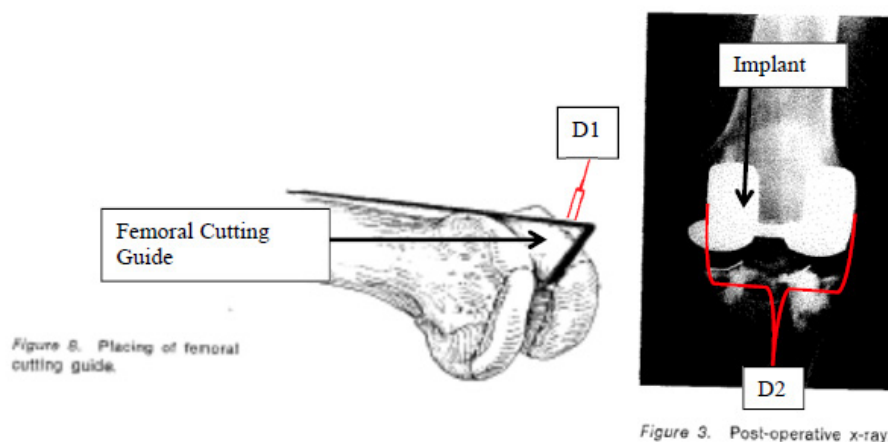
49 (Ex. 1003). The Delp Article also discloses that these implants (“replacement portions”) are approximately the width of the knee D2, whereas each guide surface has a length D1 that is approximately half the width of the knee, as shown below:



Id., Figs. 2, 3; pp. 53, 54 (Ex. 1003). As such, a person of ordinary skill in the art would understand that the Delp Article discloses a replacement portion having a transverse dimension that is larger than a transverse dimension of the guide surface.

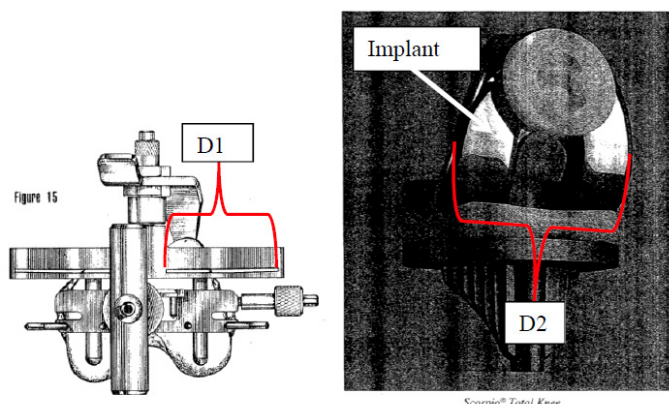
68. To the extent the Patent Owner asserts that the Delp Article does not disclose limitation (f), Turner or Scorpio discloses this limitation. For example, Turner discloses “attaching a replacement portion of the knee to the cut surface” in steps VII and IV, where “the femoral component [is] inserted,” and reinserted. Turner, pp. 185, 187 (Ex. 1008).

69. Additionally, Turner discloses an implant having “a transverse length [D2] that is larger than the guide surface length [D1]” because the femoral cutting guide (“guide member”) disclosed in Turner has a guide surface length (D1) that is substantially less than the transverse (across the knee) length (D2) of the implant, as shown below:



Turner, Figs. 3, 8; pp. 177, 181 (Ex. 1003).

70. Additionally, Scorpio discloses that the femoral implant (shown below) is “place[d] . . . on the prepared femur . . . [for] implantation.” Scorpio, p. 47 (Ex. 1009). As shown below, the femoral implant disclosed in Scorpio has “a transverse length [D2] that is larger than the guide surface length [D1]”:



Scorpio, pp. 2, 9; Fig. 15 (Ex. 1009). A person of ordinary skill in the art would understand that D2 is larger than D1 because the implant is approximately the width of the thighbone (femur) whereas D1 is smaller than the width of the thighbone (femur). To the extent the Patent Owner asserts that Scorpio does not disclose “the implant has a transverse length that is larger than the guide surface length,” as recited in limitation (g), it would have been obvious to reduce the length of the guide surface in this manner so that the guide could fit through a smaller incision, because doing so was a known solution for reducing trauma. *E.g.*, Delp ’018, col. 22, ll. 45-50 (known benefit of using “smaller jigs” is to allow “a smaller incision to be made,” which “will result in a less invasive procedure, and will lead to a shorter rehabilitation time, thereby reducing costs, morbidity, and patient complaints”) (Ex. 1005). Moreover, the sizes of cutting guides and guide surfaces vary according to the preferences of surgeons, and modifying the length of a guide surface is a matter of routine practice.

71. It would have been obvious to a person of ordinary skill in the art to combine the systems described in the Delp Article with the cutting guides and implants disclosed in Turner or Scorpio to yield predictable results. It was known in the prior art that “alignment of prosthetic components and of the limb are important factors” and that “[i]ncorrect positioning or orientation of implants can lead to accelerated wear, component loosening, and degraded functional performance.” Delp Article, p. 49 (Ex. 1003). It was further known that “[t]here are fundamental limitations of mechanical alignment systems.” *Id.*, p. 50 (Ex. 1003). The Delp Article discloses computer-assisted surgical systems for improving the alignment of mechanical instruments, such as those disclosed in Turner or Scorpio. For example, the Delp Article explains that mechanical instruments may be augmented “through the addition of measurement probes that can be used to . . . align prosthetic components.” *Id.*, p. 50 (Ex. 1003). Additionally, the Delp Article discloses the use of preoperative imaging “to guide the surgeon in the placement of the cutting jigs.” *Id.*, pp. 52-53 (Ex. 1003).

72. Using “measurement probes,” preoperative imaging, or other computer-assisted techniques disclosed in the Delp Article to improve the accuracy of mechanical instruments from Turner or Scorpio would have been no more than the predictable use of prior art elements according to their established functions.

Additionally, combining them would have required no more than routine skill, as the computer-assisted systems disclosed in the Delp Article are intended to be used to enhance instruments such as those disclosed in Turner or Scorpio. Moreover, combining the computer-assisted techniques from the Delp Article with the mechanical devices from Turner or Scorpio would not have yielded unexpected results. Thus, it would have been obvious to a person of ordinary skill in the art to augment the mechanical instruments in Turner or Scorpio with measurement probes to achieve predictable benefits such as the ability to align prosthetic components more accurately. Doing so is no more than the predictable use of prior art elements according to their established functions.

73. In summary, the chart below identifies where the above prior art references disclose and/or make obvious the limitations of claim 1 of the '896 patent.

<u>Claim 1:</u> A method of replacing at least a portion of a patient's knee, the method comprising the steps of:	<i>See, e.g.</i> , Delp Article, pp. 49-56; Figs. 1-3 (Ex. 1003); Scorpio, cover; pp.1-47 (Ex. 1009); Turner, cover; pp. 171, 173-187; Figs. 1-4, 6-15, 20-22, 24 (Ex. 1008)
(a) making an incision in a knee portion of a leg of the patient;	<i>See, e.g.</i> , Delp Article, pp. 50-53, 55; Figs. 1-3 (Ex. 1003); Scorpio, Figs. 1-3; p. 3 (Ex. 1009); Turner, pp. 180-181, 187 (Ex. 1008)
(b) determining a position of a cutting guide using	<i>See, e.g.</i> , Delp Article, pp. 49-56; Figs. 1-3 (Ex. 1003); Scorpio, pp. 5-19, 21, 23; Figs. 6-31, 36-

references derived independently from an intramedullary device;	37, 41-42 (Ex. 1009); Turner, pp. 180-182, 187-189; Figs. 1-4, 6-15, 20-22, 24 (Ex. 1008)
(c) positioning a cutting guide using the determined position, passing the cutting guide through the incision and on a surface of a distal end portion of an unresected femur, the cutting guide secured to the bone free of an extramedullary or intramedullary alignment rod;	<i>See, e.g.</i> , Delp Article, pp. 49-56; Figs. 1-3 (Ex. 1003); Scorpio, pp. 5-19, 21, 23; Figs. 6-31, 36-37, 41-42 (Ex. 1009); Turner, pp. 180-182, 187-189; Figs. 1-4, 6-15, 20-22, 24 (Ex. 1008)
(d) moving a cutting tool through the incision into engagement with a guide surface on the cutting guide; and	<i>See, e.g.</i> , Delp Article, pp. 49-56; Figs. 1-32 (Ex. 1003); Scorpio, pp. 5-19, 21, 23; Figs. 6-31, 36-37, 41-42 (Ex. 1009); Turner, pp. 180-182, 187-189; Figs. 1-4, 6-15, 20-22, 24 (Ex. 1008)
(e) forming at least an initial cut on the femur by moving the cutting tool along the guide surface;	<i>See, e.g.</i> , Delp Article, pp. 49-56; Figs. 1-3 (Ex. 1003); Scorpio, pp. 5-19, 21, 23; Figs. 6-31, 36-37, 41-42 (Ex. 1009); Turner, pp. 180-182, 187-189; Figs. 1-4, 6-15, 20-22, 24 (Ex. 1008)
(f) attaching a replacement portion of the knee to the cut surface, the replacement portion having a transverse dimension that is larger than a transverse dimension of the guide surface.	<i>See, e.g.</i> , Delp Article, pp. 49-56; Figs. 1-3 (Ex. 1003); Turner, pp. 172-177, 180-183, 185-189, 191-192; Figs. 1-4, 6-15, 20-22, 24 (Ex. 1008); Scorpio, pp. 2, 5-19, 21, 23, 25, 41, 47; Figs. 6-31, 36-37, 41-42, 45, 73, 86 (Ex. 1009)

**Claim 1 is Obvious over Delp '018
in view of any one of Turner or Scorpio**

74. As shown in the summary chart below, the method of claim 1 is rendered obvious by Delp '018 in view of Turner or Scorpio. As discussed in the previous section, the Delp Article discloses computer-assisted surgical systems developed to overcome problems with mechanical alignment systems. Delp '018 discloses an example of such a system, and expressly states that it is designed for “minimal surgical invasiveness” and to allow the use of “a smaller incision.” Delp '018, col. 1, ll. 8-11; col. 22, ll. 42-50 (Ex. 1004).

75. Delp '018 discloses a method of replacing at least a portion of a patient's knee, as recited in the preamble. For example, Delp '018 discloses “a method for implanting unicompartmental knee arthroplasty components.” *Id.*, col. 5, ll. 53-54 (Ex. 1004).

76. Delp '018 discloses limitation (a), “making an incision in a knee portion of a leg of the patient.” For example, Delp '018 discloses that “an incision is made on the patient's leg.” Delp '018, col. 16, ll. 5-7 (Ex. 1004).

77. Delp '018 discloses limitation (b), “determining a position of a cutting guide using references derived independently from an intramedullary device.” For example, Delp '018 discloses “planning software [that] determines the poses of the

femoral and tibial cutting jigs, as reflected by block 730,” where “pose” refers to “position and [] orientation.” *Id.*, col. 3, ll. 49-51; col. 14, ll. 45-48 (Ex. 1004).

Delp ’018 explicitly states that the disclosed method of performing knee arthroplasty “does not require the use of an intramedullary rod in the femur.” *Id.*, col. 5, ll. 49-51 (Ex. 1004).

78. Delp ’018 discloses limitation (c), “positioning a cutting guide using the determined position, passing the cutting guide through the incision and on a surface of a distal end portion of an unresected femur, the cutting guide secured to the bone free of an extramedullary or intramedullary alignment rod.” For example, in addition to the disclosures described in the previous paragraph, Delp ’018 further discloses that the “pins may be placed in order to secure the contouring jig 1000 to the bone.” *Id.*, col. 19, ll. 16-19 (Ex. 1004). This describes a “method of performing knee arthroplasty that does not require the use of an intramedullary rod in the femur.” *Id.*, col. 5, ll. 49-51 (Ex. 1004). Moreover, a person of ordinary skill in the art would understand that the femoral contouring jig (“cutting guide”) is secured to the bone free of an extramedullary or intramedullary alignment rod because the femoral contouring jig (“cutting guide”) is “pinned into place” rather than using such rods. *Id.*, col. 19, ll. 16-19 (Ex. 1004). For example, Delp ’018 states that “[t]he computer replaces large, complicated mechanical alignment

systems,” and identifies “an intramedullary rod” and an “extramedullary rod” as examples of such systems. Delp ’018, col. 22, ll. 45-47; col. 5, ll. 49-51; col. 2, ll. 23-31; col. 2, ll. 55-57 (Ex. 1004). Additionally, a person of ordinary skill in the art would understand that Delp ’018 discloses that a surgeon should “pass[] the cutting guide through the incision,” because the cutting guide necessarily passes through the incision in order to be positioned on the femur since no other incision is disclosed for this purpose. Additionally, this portion of limitation (c) would have been obvious to a person of ordinary skill in the art because moving a cutting guide through an incision is a routine step during a knee surgery.

79. Delp ’018 discloses limitation (d), “moving a cutting tool through the incision into engagement with a guide surface on the cutting guide.” For example, Delp ’018 discloses “femoral resection involv[ing] three different cuts.” Delp ’018, col. 21, ll. 24-25 (Ex. 1004). A person of ordinary skill in the art would understand that Delp ’018 discloses limitation (d), first because the cutting tool necessarily passes through the incision to make the cuts since no other incisions are disclosed for this purpose. A surgeon would also understand that the cutting guides disclosed in Delp ’018 are designed to guide the tool when it is engaged with the guide surface because that is the very purpose of the guide.

80. Delp '018 discloses limitation (e), “forming at least an initial cut on the femur by moving the cutting tool along the guide surface.” For example, Delp '018 discloses the “posterior cut is made first with either a saw or long burr along the front face 1030 of the femoral docking jig 1000.” Delp '018, col. 21, ll. 24-34 (Ex. 1004).

81. Delp '018 in combination with any one of Turner or Scorpio discloses limitation (f), “attaching a replacement portion of the knee to the cut surface, the replacement portion having a transverse dimension that is larger than a transverse dimension of the guide surface.” For example, Delp '018 discloses the “prosthetic components are cemented into place.” *Id.*, col. 22, ll. 22-26 (Ex. 1004). Further, as set forth above, Turner and Scorpio each disclose a “replacement portion having a transverse dimension that is larger than a transverse dimension of the guide surface.” Turner, Figs. 3, 8; pp. 177, 181 (Ex. 1004); Scorpio Technique Guide, Figs. 14, 45; pp. 2, 9, 25 (Ex. 1009).

82. It would have been obvious to a person of ordinary skill in the art to combine the system disclosed in Delp '018 with the implants and reduced size cutting guides disclosed in Turner or Scorpio. For example, Delp '018 discloses that a known benefit of using “smaller jigs” is to allow “a smaller incision to be

made.” Delp ’018 patent, col. 22, ll. 45-50 (Ex. 1004). The ’896 patent in fact identifies the same expected benefit: “[T]he instrumentation is down sized to enable the size of the incision 114 (FIG. 9).” ’896 patent, Figs. 9, 29; col. 17, ll. 49-50 (Ex. 1001). Thus, it would have been obvious to a person of ordinary skill in the art to combine the computer-assisted techniques disclosed in Delp ’018, which enable the use of “smaller jigs,” with the smaller jigs disclosed in Turner or Scorpio, to obtain expected benefits such as “a smaller incision.” Moreover, combining the computer-assisted techniques disclosed in Delp ’018 with the instrumentation disclosed in Turner or Scorpio would improve the accuracy of the limb alignment with minimal invasiveness. Delp ’018, col. 1, ll. 7-11 (Ex. 1004). Combining Delp ’018 with Turner or Scorpio is no more than the predictable use of prior art elements according to their established functions because the established function of the computer-assisted techniques disclosed in Delp ’018 are to improve the accuracy of knee replacement systems, and Turner and Scorpio are knee replacement systems whose established functions of providing tools for knee replacement benefit from improved accuracy.

83. In summary, the chart below identifies where the above prior art references disclose and/or make obvious the limitations of claim 1 of the ’896 patent.

<u>Claim 1:</u> A method of replacing at least a portion of a patient's knee, the method comprising the steps of:	<i>See, e.g., Delp '018, col. 5, ll. 53-56; col. 7, ll. 23-29 (Ex. 1004); Scorpio, cover; pp.1-47 (Ex. 1009); Turner, cover; pp. 171, 173-187; Figs. 1-4, 6-15, 20-22, 24 (Ex. 1008)</i>
(a) making an incision in a knee portion of a leg of the patient;	<i>See, e.g., Delp '018, col. 1, ll. 40-44; col. 3, ll. 20-31; col. 4, ll. 23-25; col. 5, ll. 52-55, 63-65; col. 7, l. 16; col. 16, ll. 4-7; col. 22, ll. 25, 45-50; Figs. 19, 34 (Ex. 1004); Scorpio, Figs. 1-3; p. 3 (Ex. 1009); Turner, pp. 180-181, 187 (Ex. 1008)</i>
(b) determining a position of a cutting guide using references derived independently from an intramedullary device;	<i>See, e.g., Delp '018, col. 2, ll. 21-57; col. 3, ll. 20-31; col. 3, ll. 49-51; col. 4, l. 20 – col. 5, l. 22; col. 5, ll. 49-55, 63-65; col. 5, l. 66 – col. 6, l. 2; col. 14, ll. 45-48; col. 18, l. 55 – col. 20, l. 37; col. 21, ll. 24-34; col. 22, ll. 35-50; Figs. 1, 3, 23-26, 31 (Ex. 1004); Scorpio, pp. 5-19, 21, 23; Figs. 6-31, 36-37, 41-42 (Ex. 1009); Turner, pp. 180-182, 187-189; Figs. 1-4, 6-15, 20-22, 24 (Ex. 1008)</i>
(c) positioning a cutting guide using the determined position, passing the cutting guide through the incision and on a surface of a distal end portion of an unresected femur, the cutting guide secured to the bone free of an extramedullary or intramedullary alignment rod;	<i>See, e.g., Delp '018, col. 2, ll. 21-57; col. 3, ll. 20-31, 49-51; col. 4, l. 20 – col. 5, l. 22; col. 5, ll. 49-51, 63-65; col. 5, l. 66 – col. 6, l. 2; col. 14, ll. 45-48; col. 18, ll. 55-61; col. 19, ll. 16-19; col. 18, l. 55 – col. 20, l. 37; col. 21, ll. 24-34; col. 22, ll. 35-50; Figs. 1, 3, 23-26, 31 (Ex. 1004); Scorpio, pp. 5-19, 21, 23; Figs. 6-31, 36-37, 41-42 (Ex. 1009); Turner, pp. 180-182, 187-189; Figs. 1-4, 6-15, 20-22, 24 (Ex. 1008)</i>
(d) moving a cutting tool through the incision into engagement with a guide surface on the cutting guide; and	<i>See, e.g., Delp '018, col. 2, ll. 21-57; col. 3, ll. 20-31; col. 4, l. 20 – col. 5, l. 22; col. 5, ll. 52-55, 63-65; col. 5, l. 66 – col. 6, l. 2; col. 18, l. 55 – col. 20, l. 37; col. 21, ll. 24-34; col. 22, ll. 35-50; Figs. 1, 3, 23-26, 31 (Ex. 1004); Scorpio, pp. 5-19, 21, 23; Figs. 6-31, 36-37, 41-42 (Ex. 1009); Turner, pp. 180-182, 187-189; Figs. 1-4, 6-15,</i>

	20-22, 24 (Ex. 1008)
(e) forming at least an initial cut on the femur by moving the cutting tool along the guide surface;	<i>See, e.g.,</i> Delp '018, col. 2, ll. 21-57; col. 3, ll. 20-31; col. 4, l. 20 – col. 5, l. 22; col. 5, ll. 52-55, 63-65; col. 5, l. 66 – col. 6, l. 2; col. 18, l. 55 – col. 27, l. 37; col. 21, ll. 24-34; col. 22, ll. 35-50; Figs. 1, 3, 23-26, 31 (Ex. 1004); Scorpio, pp. 5-19, 21, 23; Figs. 6-31, 36-37, 41-42 (Ex. 1009); Turner, pp. 180-182, 187-189; Figs. 1-4, 6-15, 20-22, 24 (Ex. 1008)
(f) attaching a replacement portion of the knee to the cut surface, the replacement portion having a transverse dimension that is larger than a transverse dimension of the guide surface.	<i>See, e.g.,</i> Delp '018, col. 1, ll. 7-11; col. 2, ll. 21-57; col. 3, ll. 20-31; col. 4, l. 20 – col. 5, l. 22; col. 5, ll. 52-55, 63-65; col. 5, l. 66 – col. 6, l. 2; col. 18, l. 55 – col. 27, l. 37; col. 21, ll. 24-34; col. 22, ll. 13-25, 35-50; Figs. 1, 3, 11-12, 15, 23-26, 31 (Ex. 1004); Turner, pp. 172-177, 180-183, 185-189, 191-192; Figs. 1-4, 6-15, 20-22, 24 (Ex. 1008); Scorpio, pp. 2, 5-19, 21, 23, 25, 41, 47; Figs. 6-31, 36-37, 41-42, 45, 73, 86 (Ex. 1009)

**Claim 1 is Obvious Over Stulberg
in View of Any One of Turner or Scorpio**

84. As shown in the summary chart below, the method of claim 1 is rendered obvious by Stulberg in view of Turner or Scorpio.

85. Stulberg discloses a method of replacing at least a portion of a patient's knee, as recited in the preamble. For example, Stulberg is entitled "Computer-Assisted Total Knee Replacement Arthroplasty." Stulberg, p. 25 (Ex. 1005).

86. Stulberg discloses limitation (a), “making an incision in a knee portion of a leg of the patient.” For example, Stulberg discloses using “a straight midline skin incision.” Stulberg, p. 27 (Ex. 1005); *see also* Stulberg, p. 26, Fig. 2 (Ex. 1005).

87. Stulberg discloses limitation (b), “determining a position of a cutting guide using references derived independently from an intramedullary device.” For example, Stulberg discloses a “computer-assisted technique” where the surgeon can “track . . . the position of the cutting block,” rather than introducing an “intramedullary rod . . . into the femoral canal.” Stulberg, p. 30 (Ex. 1005).

88. Stulberg discloses limitation (c), “positioning a cutting guide using the determined position, passing the cutting guide through the incision and on a surface of a distal end portion of an unresected femur, the cutting guide secured to the bone free of an extramedullary or intramedullary alignment rod.” For example, Stulberg discloses the surgeon can “then track on the monitor the position of the cutting block relative to the distal femur.” Stulberg, p. 30 (Ex. 1005). Moreover, a person of ordinary skill in the art would understand that Stulberg discloses that the “cutting guide [is] secured to the bone free of an extramedullary or intramedullary alignment rod” because the cutting guide is aligned using the computer and

“secured to the femur with a 5-mm threaded wire” instead. Stulberg, p. 30 (Ex. 1005). Additionally, a person of ordinary skill in the art would understand that Stulberg discloses “passing the cutting guide through the incision,” or alternatively, it would have been obvious to do so, because the femoral cutting guide is necessarily moved through the incision so it may be positioned on the femur, as no other incision is disclosed for this purpose.

89. Stulberg discloses limitation (d), “moving a cutting tool through the incision into engagement with a guide surface on the cutting guide.” For example, Stulberg discloses that the “distal femur is . . . resected.” Stulberg, Fig. 17B; pp. 30-31, 36 (Ex. 1005). A person of ordinary skill in the art would understand that Stulberg discloses “moving a cutting tool through the incision,” or alternatively, it would have been obvious to do so, because the cutting tool is necessarily moved through the incision, as there is no other incision disclosed for this purpose.

90. Stulberg discloses limitation (e) “forming at least an initial cut on the femur by moving the cutting tool along the guide surface.” For example, as shown in Figure 17B above, Stulberg discloses forming at least an initial cut on the femur by moving the cutting tool along the guide surface. Stulberg, Fig. 17B (Ex. 1005).

91. Stulberg in combination with Turner or Scorpio discloses limitation (f), “attaching a replacement portion of the knee to the cut surface, the replacement portion having a transverse dimension that is larger than a transverse dimension of the guide surface.” For example, Stulberg discloses that the alignment of the leg is confirmed with the implants installed. Stulberg, Fig. 19B; p. 37 (Ex. 1005). Further, as set forth above, Turner and Scorpio each disclose a “replacement portion having a transverse dimension that is larger than a transverse dimension of the guide surface.” Turner, Figs. 8, 14 (Ex. 1004); Scorpio Technique Guide, Figs. 14, 45 (Ex. 1009).

92. It would have been obvious to a person of ordinary skill in the art to utilize the computer-assisted system disclosed in Stulberg in combination with the cutting guides and implants disclosed in Turner or Scorpio. The person of ordinary skill would be motivated to follow the teachings of Stulberg that computer-assisted surgery can overcome the deficiencies of standard mechanical measuring techniques, such as the inability to locate crucial alignment landmarks, the presumption that bone geometry is standardized, and the reliance on visual inspection to verify proper alignment of the implant. Stulberg, p. 25 (Ex.1005). As such, a person of ordinary skill in the art would want to combine the teachings of Stulberg with mechanical instruments from Turner and Scorpio to yield the

predictable improvement of a more accurate surgical outcome. Stulberg, p. 33 (Ex. 1005). This combination is no more than the predictable use of prior art technology according to its established function to achieve a predictable result.

93. In summary, the chart below identifies where the above prior art references disclose and/or make obvious the limitations of claim 1 of the '896 patent.

<u>Claim 1:</u> A method of replacing at least a portion of a patient's knee, the method comprising the steps of:	<i>See, e.g.</i> , Stulberg, pp. 25-39; Figs. 1-20 (Ex. 1005); Scorpio, cover; pp.1-47 (Ex. 1009); Turner, cover; pp. 171, 173-187; Figs. 1-4, 6-15, 20-22, 24 (Ex. 1008)
(a) making an incision in a knee portion of a leg of the patient;	<i>See, e.g.</i> , Stulberg, pp. 26-28, 39; Figs. 2, 6 (Ex. 1005); Scorpio, Figs. 1-3; p. 3 (Ex. 1009); Turner, pp. 180-181, 187 (Ex. 1008)
(b) determining a position of a cutting guide using references derived independently from an intramedullary device;	<i>See, e.g.</i> , Stulberg, pp. 25, 27-32, 35-36; Figs. 1-4, 7, 9-11, 15, 16, 19 (Ex. 1005); Scorpio, pp. 5-19, 21, 23; Figs. 6-31, 36-37, 41-42 (Ex. 1009); Turner, pp. 180-182, 187-189; Figs. 1-4, 6-15, 20-22, 24 (Ex. 1008)
(c) positioning a cutting guide using the determined position, passing the cutting guide through the incision and on a surface of a distal end portion of an unresected femur, the cutting guide secured to the bone free of an extramedullary or intramedullary alignment	<i>See, e.g.</i> , Stulberg, pp. 25, 27-32, 35-39; Figs. 1-4, 6-7, 9-11, 15, 16, 19 (Ex. 1005); Scorpio, pp. 5-19, 21, 23; Figs. 6-31, 36-37, 41-42 (Ex. 1009); Turner, pp. 180-182, 187-189; Figs. 1-4, 6-15, 20-22, 24 (Ex. 1008)

rod;	
(d) moving a cutting tool through the incision into engagement with a guide surface on the cutting guide; and	<i>See, e.g.,</i> Stulberg, pp. 25, 27-32, 35-39; Figs. 1-4, 6-7, 9-11, 15, 16, 19 (Ex. 1005); Scorpio, pp. 5-19, 21, 23; Figs. 6-31, 36-37, 41-42 (Ex. 1009); Turner, pp. 180-182, 187-189; Figs. 1-4, 6-15, 20-22, 24 (Ex. 1008)
(e) forming at least an initial cut on the femur by moving the cutting tool along the guide surface;	<i>See, e.g.,</i> Stulberg, pp. 25, 27-32, 35-39; Figs. 1-4, 7, 9-11, 15, 16, 17, 19 (Ex. 1005); Scorpio, pp. 5-19, 21, 23; Figs. 6-31, 36-37, 41-42 (Ex. 1009); Turner, pp. 180-182, 187-189; Figs. 1-4, 6-15, 20-22, 24 (Ex. 1008)
(f) attaching a replacement portion of the knee to the cut surface, the replacement portion having a transverse dimension that is larger than a transverse dimension of the guide surface.	<i>See, e.g.,</i> Stulberg, pp. 25, 27-32, 35-37, 39; Figs. 1-4, 7, 9-11, 15, 16, 17, 19-20 (Ex. 1005); Turner, pp. 172-177, 180-183, 185-189, 191-192; Figs. 1-4, 6-15, 20-22, 24 (Ex. 1008); Scorpio, pp. 2, 5-19, 21, 23, 25, 41, 47; Figs. 6-31, 36-37, 41-42, 45, 73, 86 (Ex. 1009)

Independent Claim 13

94. Challenged claim 13 recites a method of replacing at least a portion of a joint in a patient, the method comprising the steps of:

(a) obtaining a customized cutting guide fabricated for the patient based on preoperative information, the cutting guide positionable in a pre-determined position on a bone of the joint using references derived independently from an intramedullary device;

(b) making an incision adjacent to the joint in the patient;

(c) positioning the cutting guide in the pre-determined position by passing the cutting guide through the incision and on a surface of an end portion of an unresected bone of the joint;

(d) moving a cutting tool through the incision into engagement with a guide surface on the positioned cutting guide;

(e) cutting the unresected bone of the joint for the first time, by moving the cutting tool along the guide surface;

(f) attaching a replacement portion of the knee to the cut surface, the replacement portion having a transverse dimension that is larger than a transverse dimension of the guide surface; and

(g) disposing of the cutting guide, as it is no longer safely usable the bone for which it was custom fabricated having been cut and therefore changed. ('896 patent, claim 1, Ex. 1001). Each of the steps of claim 13 are shown in the prior art.

Claim 13 is Anticipated by Radermacher '157

95. As shown in the summary chart below, the method of claim 13 is anticipated by Radermacher '157.

96. Radermacher '157 discloses a method of replacing at least a portion of a joint in a patient, as recited in the preamble. For example, Radermacher '157

discloses replacing a “knee-joint.” Radermacher ’157, pp. 19, 30; Figs. 13a-13d (Ex. 1007).

97. Radermacher ’157 discloses limitation (a), “obtaining a customized cutting guide fabricated for the patient based on preoperative information, the cutting guide positionable in a pre-determined position on a bone of the joint using references derived independently from an intramedullary device.” For example, Radermacher ’157 discloses “individual templates” with “guide means” that are manufactured for specific patients based on “preoperative” images.

Radermacher ’157, pp. 9-11 (Ex. 1007). The individual templates are customized with a “negative image” of the unique structure of a specific patient’s bone so that they can be positioned on the bone “in a clearly defined position.”

Radermacher ’157, pp. 9-10 (Ex. 1007). The individual templates are positioned with the negative image of the bone structure, “without any further intraoperative devices,” such as intramedullary and extramedullary devices. Radermacher ’157, p. 15 (Ex. 1007). A person of ordinary skill in the art would therefore understand Radermacher ’157 discloses “individual templates” (“customized cutting guide[s]”) fabricated for the patient based on preoperative information, the cutting guide positionable in a pre-determined position on a bone of the joint using references derived independently from an intramedullary device.

98. Radermacher '157 discloses limitation (b), “making an incision adjacent to the joint in the patient.” For example, Radermacher '157 discloses pre-operative planning of the “incision” for a surgery. Radermacher '157, p. 1 (Ex. 1007). Additionally, a person of ordinary skill in the art would understand that Radermacher '157 discloses limitation (b) because a person of ordinary skill in the art would understand that the incision disclosed in Radermacher '157 is the incision adjacent to the joint that is routinely used by surgeons in knee replacement surgery such as that disclosed in Radermacher '157. Radermacher '157, pp. 19, 30; Figs. 13a-13d (Ex. 1007).

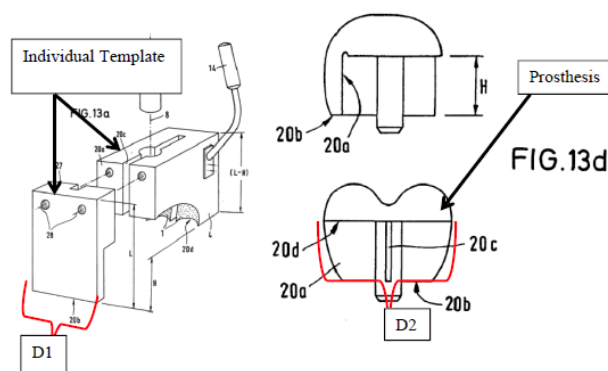
99. Radermacher '157 discloses limitation (c), “positioning the cutting guide in the pre-determined position by passing the cutting guide through the incision and on a surface of an end portion of an unresected bone of the joint.” For example, Radermacher '157 discloses an “intraoperative procedure” where “the individual template 4 is set onto the bone 17 in a defined manner.” Radermacher '157, p. 30; Fig. 13c (Ex. 1007). Additionally, a person of ordinary skill in the art would understand that Figure 13c of Radermacher '157 shows an individual template (“cutting guide”) positioned in a pre-determined position on a surface of an end portion of unresected bone (17) in the knee joint.

Radermacher '157, Fig. 13c (Ex. 1007). A person of ordinary skill in the art would

understand that Radermacher '157 discloses “passing the cutting guide through the incision” because placing the individual template on the bone necessarily requires passing the cutting guide through the incision so that it can be placed on the bone.

100. Radermacher '157 discloses limitation (d), “moving a cutting tool through the incision into engagement with a guide surface on the positioned cutting guide,” and limitation (e), “cutting the unresected bone of the joint for the first time, by moving the cutting tool along the guide surface.” For example, Radermacher '157 discloses that a “cut is formed along the cutting plane 20a. . . . cut 20b can be performed . . . [with] additional template 27 . . . the groove (cut 20c) is milled or sawed . . . and then, cut 20d is formed along the lower edge of the individual template 4.” Radermacher '157, p. 30; Figs. 13a, 13c (Ex. 1007). A person of skill in the art would understand Radermacher '157 to disclose limitation (d) because making cuts with an individual templates necessarily involves moving a cutting tool through the incision into engagement with a guide surface on the positioned cutting guide. A person of ordinary skill in the art would additionally understand Radermacher '157 discloses limitation (e) because making the cuts with individual template necessarily requires cutting the unresected bone of the joint for the first time by moving the cutting tool along the guide surface of the individual template.

101. Radermacher '157 discloses limitation (f), “attaching a replacement portion of the knee to the cut surface, the replacement portion having a transverse dimension that is larger than a transverse dimension of the guide surface.” For example, Radermacher '157 discloses a “knee joint head prosthesis” (“replacement portion”) implanted in the cut surface of a femur (17). Radermacher '157, p. 30; Fig. 13b (Ex. 1007). A person of skill in the art would understand that Radermacher '157 discloses that the “knee joint head prosthesis” (“replacement portion”) has a transverse dimension D2 that is larger than a transverse dimension of the guide surface D1, as shown below:



Radermacher '157, p. 30; Figs. 13a, 13d (Ex. 1007). One can see from Fig. 13d that the transverse length of the prosthesis D2 is approximately twice the height “H”, whereas the guide surface length D1 in Fig. 13a is approximately the same as height “H”, and therefore, the transverse length of the prosthesis D2 is larger than the guide surface length D1.

102. Radermacher '157 discloses limitation (g), “disposing of the cutting guide, as it is no longer safely usable the bone for which it was custom fabricated having been cut and therefore changed.” Radermacher '157 expressly acknowledges that its templates are designed to create a “negative image” of the unique structure of a specific patient’s bone. Radermacher '157, pp. 9-11 (Ex. 1006). Therefore, these templates are incapable of being safely used on the bone of another patient who will have different bone structure or even for the same patient at a later date once her bones have been cut and thus no longer conform to the template.

103. In summary, the chart below identifies where the above prior art references disclose and/or make obvious the limitations of claim 13 of the '896 patent.

<u>Claim 13:</u> A method of replacing at least a portion of a joint in a patient, the method comprising the steps of	<i>See, e.g.,</i> Radermacher '157, cover; pp. 1-44; Figs. 1-29 (Ex. 1007)
(a) obtaining a customized cutting guide fabricated for the patient based on preoperative information, the cutting guide positionable in a pre-	<i>See, e.g.,</i> Radermacher '157, cover; pp. 1-44; Figs. 1-29 (Ex. 1007)

determined position on a bone of the joint using references derived independently from an intramedullary device;	
(b) making an incision adjacent to the joint in the patient;	<i>See, e.g., Radermacher '157, pp. 1, 9-11, 15, 19, 22, 30; Fig. 13a-d (Ex. 1007)</i>
(c) positioning the cutting guide in the pre-determined position by passing the cutting guide through the incision and on a surface of an end portion of an unresected bone of the joint;	<i>See, e.g., Radermacher '157, pp. 1-20, 22, 30, 34-44; Figs. 13a-d, 15-19 (Ex. 1007)</i>
(d) moving a cutting tool through the incision into engagement with a guide surface on the positioned cutting guide;	<i>See, e.g., Radermacher '157, pp. 1-20, 22, 30, 34-44; Figs. 13a-d, 15-19 (Ex. 1007)</i>
(e) cutting the unresected bone of the joint for the first time, by moving the cutting tool along the guide surface;	<i>See, e.g., Radermacher '157, pp. 1-20, 22, 30, 34-44; Figs. 13a-d, 15-19 (Ex. 1007)</i>
(f) attaching a replacement portion of the knee to the cut surface, the replacement portion having a transverse dimension that is larger than a transverse dimension of the guide surface; and	<i>See, e.g., Radermacher '157, pp. 1-20, 22, 30, 34-44; Figs. 13a-d, 15-19 (Ex. 1007)</i>
(g) disposing of the cutting guide, as it is no longer	<i>See, e.g., Radermacher '157, pp. 1-20, 22, 30, 34-44; Figs. 13a-d, 15-19 (Ex. 1007)</i>

safely usable the bone for which it was custom fabricated having been cut and therefore changed.	
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**Claim 13 is Obvious over the Radermacher Article
in view of any one of Turner or Scorpio**

104. As shown in the summary chart below, the method of claim 13 is rendered obvious by the Radermacher Article in view of Turner or Scorpio.

105. The Radermacher Article discloses a method of replacing at least a portion of a joint in a patient, as recited in the preamble. For example, the Radermacher Article is titled “Computer Assisted Orthopaedic Surgery with Image Based Individual Templates.” Radermacher Article, pp. 29, 31-32 (Ex. 1006).

106. The Radermacher Article discloses limitation (a), “obtaining a customized cutting guide fabricated for the patient based on preoperative information, the cutting guide positionable in a pre-determined position on a bone of the joint using references derived independently from an intramedullary device.” First, the Radermacher Article, for example, discloses “[i]ndividual templates are customized on the basis of three-dimensional reconstructions of the bone structures extracted from computerized tomographic (CT) image data in accordance with individual preoperative surgical planning.” Radermacher Article, p. 29 (Ex. 1006).

Second, the Radermacher Article discloses, for example, that individual templates make it “possible to reproduce the preoperatively planned position exactly.”

Radermacher Article, p. 31 (Ex. 1006). A person of ordinary skill in the art would understand that the Radermacher Article thus discloses “using references derived independently from an intramedullary device” because the individual templates use a preoperatively planned position, rather than a references derived from an intramedullary device.

107. The Radermacher Article discloses limitation (b), “making an incision adjacent to the joint in the patient.” A person of ordinary skill in the art would understand that the Radermacher Article discloses limitation (b) because a person of ordinary skill in the art would understand that to conduct the surgery disclosed in the Radermacher Article, she would have to make the incision adjacent to the joint that is routinely used by surgeons in knee replacement surgery in order to access the damaged portions of the bone that need to be replaced.

108. The Radermacher Article discloses limitation (c), “positioning the cutting guide in the pre-determined position by passing the cutting guide through the incision and on a surface of an end portion of an unresected bone of the joint.” For example, the Radermacher Article states that with the disclosed individual

templates, “it is possible to reproduce the preoperatively planned position exactly.” Radermacher Article, p. 31 (Ex. 1006); *see also* Radermacher Article, p. 28-29 (Ex. 1006). A person of ordinary skill in the art would understand the Radermacher Article discloses “passing the cutting guide through the incision” because placing the individual template in the “preoperatively planned position” on the bone necessarily requires passing the cutting guide through the incision so that it can be placed on the bone. Additionally, this portion of limitation (c) would have been obvious to a person of ordinary skill in the art because moving a cutting guide through an incision is a routine step during a knee surgery.

109. The Radermacher Article discloses limitation (d), “moving a cutting tool through the incision into engagement with a guide surface on the positioned cutting guide.” For example, the Radermacher Article discloses that a “conventional saw guide can be mounted on the individual template, which serves as a reference base for subsequent work on the bone.” Radermacher Article, p. 31 (Ex. 1006). A person of ordinary skill in the art would understand the Radermacher Article discloses limitation (d) because making the planned cuts with individual templates necessarily involves moving a cutting tool through the incision into engagement with a guide surface on the positioned cutting guide. Additionally, limitation (d) would have been obvious to a person of ordinary skill

in the art because moving a cutting tool such as a bone saw through an incision is a routine and necessary part of knee replacement procedures so that the surgeon can reach the bone, and no other incision is disclosed for that purpose.

110. The Radermacher Article discloses limitation (e), “cutting the unresected bone of the joint for the first time, by moving the cutting tool along the guide surface.” For example, as described in the preceding paragraph, the Radermacher Article discloses making a “cut” using an individual template with a “saw guide.” Radermacher Article, p. 31 (Ex. 1006). A person of ordinary skill in the art would understand the Radermacher Article discloses limitation (e) because making the planned cuts with individual templates necessarily requires cutting the unresected bone of the joint for the first time by moving the cutting tool along the guide surface of the “saw guide.” Additionally, limitation (e) would have been obvious to a person of ordinary skill in the art because it is a routine part of knee replacement.

111. The Radermacher Article in combination with Turner or Scorpio discloses limitation (f), “attaching a replacement portion of the knee to the cut surface, the replacement portion having a transverse dimension that is larger than a transverse dimension of the guide surface.” For example, the Radermacher Article

discloses “placement of implant components” in a “total knee arthroplasty.”

Radermacher Article, p. 31 (Ex. 1006). Further, as set forth above, Turner and Scorpio each disclose a “replacement portion having a transverse dimension that is larger than a transverse dimension of the guide surface.” Turner, Figs. 8, 14 (Ex. 1004); Scorpio Technique Guide, Figs. 14, 45 (Ex. 1009).

112. It would have been obvious to a person of ordinary skill in the art to utilize the individual templates disclosed in the Radermacher Article in combination with the cutting guides and implants disclosed in Turner or Scorpio because the Radermacher Article discloses using computer assisted techniques “for the preoperative customization” of “mechanical tool guides,” such as those disclosed in Turner or Scorpio. Radermacher Article, p. 28 (Ex. 1006). Thus, combining the Radermacher Article with Turner or Scorpio would yield the predictable results of providing the surgeon with “the precise spatial correspondence between the individual bone structure in situ and the intended position of the tool guides,” such that the surgeon can more accurately position the tool guides disclosed in Turner or Scorpio. Radermacher Article, p. 29 (Ex. 1006). Doing so is no more than the predictable use of prior art elements according to their established functions, such as using them for knee replacement (Turner or

Scorpio), and improving the accuracy with which such instrumentation can be placed on the bone (Radermacher).

113. The Radermacher Article discloses limitation (g), “disposing of the cutting guide, as it is no longer safely usable the bone for which it was custom fabricated having been cut and therefore changed.” The Radermacher Article expressly acknowledges that its templates are designed to have “the precise spatial correspondence between the individual bone structure in situ and the intended position of the tool guides.” Radermacher Article, p. 29 (Ex. 1006). Therefore, these templates are incapable of being safely used on the bone of another patient who will have different “individual bone structure,” or even for the same patient at a later date once her bones have been cut and thus no longer conform to the template. It would have been obvious to a person of ordinary skill in the art to dispose of a cutting guide after performing the procedures disclosed in the Radermacher Article.

114. In summary, the chart below identifies where the above prior art references disclose and/or make obvious the limitations of claim 13 of the '896 patent.

Claim 13: 13. A method of	<i>See, e.g.,</i> Radermacher Article, pp. 28-38; Figs.
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replacing at least a portion of a joint in a patient, the method comprising the steps of	1-4 (Ex. 1006); Scorpio, cover; pp.1-47 (Ex. 1009); Turner, cover; pp. 171, 173-187; Figs. 1-4, 6-15, 20-22, 24 (Ex. 1008)
(a) obtaining a customized cutting guide fabricated for the patient based on preoperative information, the cutting guide positionable in a pre-determined position on a bone of the joint using references derived independently from an intramedullary device;	<i>See, e.g.</i> , Radermacher Article, pp. 28-38; Figs. 1-4 (Ex. 1006); Scorpio, pp. 5-19, 21, 23; Figs. 6-31, 36-37, 41-42 (Ex. 1009); Turner, pp. 180-182, 187-189; Figs. 1-4, 6-15, 20-22, 24 (Ex. 1008)
(b) making an incision adjacent to the joint in the patient;	<i>See, e.g.</i> , Radermacher Article, pp. 28-32; Fig. 2 (Ex. 1006); Scorpio, Figs. 1-3; p. 3 (Ex. 1009); Turner, pp. 180-181, 187 (Ex. 1008)
(c) positioning the cutting guide in the pre-determined position by passing the cutting guide through the incision and on a surface of an end portion of an unresected bone of the joint;	<i>See, e.g.</i> , Radermacher Article, pp. 28-31; Fig. 2 (Ex. 1006); Scorpio, pp. 5-19, 21, 23; Figs. 6-31, 36-37, 41-42 (Ex. 1009); Turner, pp. 180-182, 187-189; Figs. 1-4, 6-15, 20-22, 24 (Ex. 1008)
(d) moving a cutting tool through the incision into engagement with a guide surface on the positioned cutting guide;	<i>See, e.g.</i> , Radermacher Article, pp. 28-31; Fig. 2 (Ex. 1006); Scorpio, pp. 5-19, 21, 23; Figs. 6-31, 36-37, 41-42 (Ex. 1009); Turner, pp. 180-182, 187-189; Figs. 1-4, 6-15, 20-22, 24 (Ex. 1008)
(e) cutting the unresected bone of the joint for the first time, by moving the cutting tool along the guide surface;	<i>See, e.g.</i> , Radermacher Article, pp. 28-31; Fig. 2 (Ex. 1006); Scorpio, pp. 5-19, 21, 23; Figs. 6-31, 36-37, 41-42 (Ex. 1009); Turner, pp. 180-182, 187-189; Figs. 1-4, 6-15, 20-22, 24 (Ex. 1008)
(f) attaching a replacement portion of the	<i>See, e.g.</i> , Radermacher Article, pp. 28-31; Figs. 1-4 (Ex. 1006); Turner, pp. 174-175, 181-183,

knee to the cut surface, the replacement portion having a transverse dimension that is larger than a transverse dimension of the guide surface; and	185-186 (Ex. 1008); Scorpio Technique Guide, Figs. 14, 45 (Ex. 1009); Turner, pp. 172-177, 180-183, 185-189, 191-192; Figs. 1-4, 6-15, 20-22, 24 (Ex. 1008); Scorpio, pp. 2, 5-19, 21, 23, 25, 41, 47; Figs. 6-31, 36-37, 41-42, 45, 73, 86 (Ex. 1009)
(g) disposing of the cutting guide, as it is no longer safely usable the bone for which it was custom fabricated having been cut and therefore changed.	<i>See, e.g.</i> , Radermacher Article, p. 28-32; Fig. 1-4 (Ex. 1006); Scorpio, pp. 5-19, 21, 23; Figs. 6-31, 36-37, 41-42 (Ex. 1009); Turner, pp. 180-182, 187-189; Figs. 1-4, 6-15, 20-22, 24 (Ex. 1008)

Availability for Cross-Examination

115. In signing this declaration, I recognize that the declaration will be filed as evidence in a contested case before the Patent Trial and Appeal Board of the United States Patent and Trademark Office. I also recognize that I may be subject to cross examination in the case and that cross examination will take place within the United States. If cross examination is required of me, I will appear for cross examination within the United States during the time allotted for cross examination.

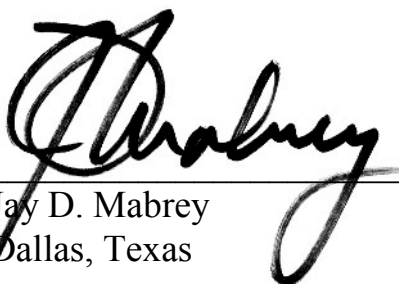
Right to Supplement

116. I reserve the right to supplement my opinions in the future to respond to any arguments that Patent Owner raises and to take into account new information as it becomes available to me.

Jurat

I declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1101 of Title 18 of the United States Code.

Dated: September 25, 2013



Jay D. Mabrey
Dallas, Texas

APPENDIX A

CURRICULUM VITAE

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Date of Preparation: 09/24/2013

I. GENERAL INFORMATION

A. Personal Data:

Citizenship Status: US

B. Education:

YEAR	DEGREE	MAJOR	INSTITUTION/LOCATION
2012	MBA	Business	Texas Woman's Univ, Denton, TX
1981	MD	Medicine	Weill Cornell Medical College, New York, NY
1977	BA	Biochemistry	Cornell University, Ithaca, NY
1973			Howland High School, Warren, OH

C. Postgraduate Training:

YEAR	DEGREE	MAJOR	INSTITUTION/LOCATION
1991		Fellowship in Biomechanics and Total Joints	The Hospital for Special Surgery, New York, NY
1987		Chief Resident in Orthopaedics	Duke University Medical Center, Durham, NC
1983-86		Resident in Orthopaedics	Duke University Medical Center
1982		Resident in General Surgery	Duke University Medical Center
1981		Intern in General Surgery	Duke University Medical Center

D. Academic Appointments:

YEAR	POSITION	INSTITUTION/LOCATION
2012-Present	Professor of Surgery	Texas A&M Health Science Center College of Medicine, Bryan, TX
2004-Present	Chief, Department of Orthopaedics	Baylor University Medical Center, Dallas, TX
2003-2004	Professor of Orthopaedic Surgery	University of Texas Health Science Center at San Antonio, Department of Orthopaedic Surgery
1998-2003	Associate Professor of Orthopaedic Surgery	University of Texas Health Science Center at San Antonio, Department of Orthopaedics
1995-2002	Chief, Orthopaedic Service	Audie L. Murphy VA Medical Center, San Antonio, Texas
1993-1998	Assistant Professor of Orthopaedic Surgery	University of Texas Health Science Center at San Antonio, Department of Orthopaedics
1991-1993	Military Consultant in Orthopaedic Surgery	University of Texas Health Science Center at San Antonio, Department of Orthopaedics
1991-1993	Orthopaedic Staff Physician	Brooke Army Medical Center, San Antonio, Texas

1990-1991	Clinical Assistant Professor of Orthopaedic Surgery	The Hospital for Special Surgery, New York, NY
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E. Other Employment:

YEAR	POSITION	INSTITUTION/LOCATION
Civilian		
2010-Present	Consultant	Parcell Labs – Stem Cells – Needham, MA
2007-Present	Design Consultant	Exactech – CR+ Knee – Gainesville, FL
2006-2010	Chairman	FDA – Orthopaedic Devices Panel – Rockville, MD
2004-2006	Panelist	FDA – Orthopaedic Devices Panel – Rockville, MD
2001-2004	Consultant	Source Medical (Advisory Board) Birmingham, AL
2000-2004	Consultant	DePuy Inc. (Surgical Robotics) Warsaw, IN
1995-1996	Consultant	Osteobiologics Inc. (Actaeon Probe) San Antonio, TX
1995-1997	Consultant	Howmedica (Adult Reconstruction) Rutherford, NJ
1994-1996	Consultant	High Techsplinations (Virtual Reality) Rockville, MD
1994-1996	Consultant	Kinetic Concepts International (Plexipulse) San Antonio, TX
1992-1994	Consultant	LifeQuest Medical (Osteoport) San Antonio, TX
1991-1997	Consultant	Smith+Nephew (Adult Reconstruction) Memphis, TN
1989-Present	CEO	Mabrey Medical Templates (Medical Art) Dallas, TX
Military		
1991-1993	Surgeon	Adult Reconstruction Service, Brooke Army Medical Center, San Antonio, TX
1991-1993	Consultant	John F. Kennedy Special Warfare Center, Fort Bragg, NC
1987-1990	Surgeon	Winn Army Community Hospital, Fort Stewart, GA
1981-1987	Army Reserve	Duke University Medical Center, Durham, NC
1977-1981	Army Reserve	Cornell University Medical College, New York, NY

F. Certification and Licensure:

1. Certification:

BOARD	DATE	NUMBER
American Board of Orthopaedic Surgery	July, 1989	n/a
National Board of Medical Examiners	1982	n/a

2. Recertification:

BOARD	DATE
American Board of Orthopaedic Surgery (Oral)	July, 1998
American Board of Orthopaedic Surgery (Computer)	Jan 1, 2010 – Dec 31, 2019

3. Licensure:

STATE	DATE	PERM/TEMP	NUMBER	RENEWAL DATE
Texas	11/14/1992	Permanent	J2665	August, 2013

G. Honors and Awards:

CORNELL UNIVERSITY

B.A. cum laude in Biological Sciences - 1977
Awarded for honors research in biochemistry.

WEILL CORNELL MEDICAL COLLEGE

Thompson Award - 1981
Presented by The Hospital for Special Surgery to the senior Cornell medical student exhibiting "excellence in orthopaedics."

CLINICAL ORTHOPAEDIC SOCIETY

Travelling Fellowship – 1998-1999

Study of surgical techniques in pelvic osteotomies

TEXAS WOMAN'S UNIVERSITY

Outstanding Graduate Student - 2013

MBA Program, School of Management

SMALL BUSINESS INSTITUTE

Project of the Year – Graduate Business Plan - 2013

“Joint Improvement Consulting Team, LLC”

H. Patents:

UNITED STATES PATENT AND TRADEMARK OFFICE

Patent # 8,414,653 – issued 04/09/2013

“Knee prosthesis system with at least a first tibial portion element (a tibial insert or tibial trial) and a second tibial portion element (a tibial insert or tibial trial), wherein each of the first tibial portion element and the second tibial portion element has a different slope.”

UNITED STATES PATENT AND TRADEMARK OFFICE

Patent # 8,506,640 – issued 08/13/2013

“Systems and methods relating to a knee prosthesis capable of conversion from a cruciate retaining type prosthesis to a posterior stabilizing type prosthesis.”

II. TEACHING

A. Classroom/Laboratory:

YEAR(S)	COURSE TITLE/CLOCK HOURS/NUMBER OF STUDENTS	S*/L**	HOURS/ CLASS/LAB	ROLE
2011-Present	MSIII/IV Lectures	MS	1	Lecturer
1994-2004	MS I Orthopaedic Lecture Series 1 hr/yr, 200 students	MS/U	1	Lecturer
1994-2004	MS II Orthopaedic Lecture Series 1 hr/yr, 200 students	MS/U	1	Lecturer
1996-2004	Living Anatomy Course 4 hrs/yr, 16 students	MS/U	4	Instructor
2000-2004	Introduction to Arthritis (PT) 2 hrs/yr, 40 students	AH/U	2	Lecturer
2000-2004	Geriatric Scholars Program 1 hr/yr, 10 – 20 students	MS/P	1	Lecturer
1995-2004	Introduction to the Hip 12 hrs/yr, 3 – 6 students	MS/U	1	Lecturer
1994-2004	Basic Science Lecture Series 6 hrs/yr, 30 residents	MS/R	1	Lecturer
1992-2004	Orthopaedic Grand Rounds 4 hrs/yr, 50 participants	MS/P,R,U	1	Lecturer
2001	Mini-Medical School – Orthopaedic Implants	MS/U	1	Lecturer
American Academy of Orthopaedic Surgeons (AAOS)				
2012	Instructional Course Lectures	P	2	Lecturer/Moderator

1997	Current Issue and Controversies in Hip and Knee Arthroplasty	P	2/8	Lecturer and Instructor
1996-2006	Instructional Course Lectures	P	2	Lecturer
2003-2005	Information Technology Course	P	8	Chairman and Lecturer
1996	Computer Boot Camp for Orthopaedic Surgeons (x3) 2 days per course	P	16	Chairman and Lecturer

Clock hours do not reflect preparation time

B. Clinical Teaching:

YEAR(S)	SETTING	S*/L**	WKS./YR.	HRS./WK.
2011-Present	Baylor University Medical Center	MS	26	16
1993-2004	University Hospital			
	University Clinic	MS/U,R	48	12
	TDI/Brady Green Clinic	MS/U,R	48	4
	Operating Room	MS/U,R	48	20
	Ward	MS/U,R	48	3
1993-2002	Audie Muphy VAMC			
	Hip/Knee Clinic	MS/U,R	48	2
	Operating Room	MS/U,R	48	8
1991-1992	Brooke Army Medical Center			
	Hip/Knee Clinic	R	50	8
	Operating Room	R	50	16
1990-1991	The Hospital for Special Surgery			
	Rheumatoid Arthritis Clinic	MS/U,R	50	3
	Dana Engineering Center	MS/U,R	50	12
	Operating Room	MS/U,R	50	20

C. Instructional Development:

1. Formal Study to Improve Teaching and Leadership Abilities:

2011-2012	EMBA – Texas Woman’s University
2005-2006	Accelerating Best Care (ABC Baylor) – Quality Improvement Course
1999, 2005	Arthroscopy Association of North America – “Masters Experience” in Arthroscopy of the Hip (learning to teach residents hip arthroscopy)
1997	AAOS - Orthopaedic Educators’ Course
1994	AAOS - Course on test writing skills
1994	Medical Spanish Course - Instituto Panamericano
1993	Teaching Skills Course for Health Professions Educators
	Division of Instructional Development
	Office of Educational Resources, UTHSCSA

(AAOS – American Academy of Orthopaedic Surgeons)

2. Research Concerning Teaching:

Virtual Reality Surgical Simulation of Arthroscopy of the Knee

After introducing the concept of a virtual reality knee simulator at the AAOS annual meeting in 1996, I subsequently became chairman of the AAOS Task Force on Virtual Reality. Those efforts have now culminated in the ArthroSim – a virtual reality surgical simulator for knee and shoulder arthroscopy – that is now commercially available to teaching programs.

3. Bibliography Concerning Teaching:

- a. Mabrey JD: “Bones, Muscles, and Joints,” in **The New Book of Knowledge: Health and Medicine Annual, 1995**. Castagno JM, ed., Grolier Incorporated, 1995.
- b. Mabrey JD: “Bones, Muscles, and Joints,” in **The New Book of Knowledge: Health and Medicine Annual, 1996**. Castagno JM, ed., Grolier Incorporated, 1996.
- c. Mabrey JD: “Computers “Learn” to Take Dictation.” **American Academy of Orthopaedic Surgeons Bulletin**, 46(3), June, 1998.
- d. Mabrey JD: “Digital Imaging: From Shoot to Show.” **American Academy of Orthopaedic Surgeons Bulletin**, 48(3), June, 2000.
- e. Mabrey JD: “Convergence of Technologies: Mobile Devices put a Computer in Your Pocket.” **American Academy of Orthopaedic Surgeons Bulletin**, 50(2), April, 2002.
- f. Mabrey JD, Trick L: “Surgical Approaches to the Hip.” in **Contemporary Extensile Exposures in Orthopaedic Surgery**, Williams RP and Heckman JD(eds). *Williams & Wilkins*, Baltimore, 1996.
- g. “Self-Assessment Examination – Adult Reconstructive Surgery of the Hip and Knee.” **American Academy of Orthopaedic Surgeons**, Rosemont, Ill., 1998.
- h. Agrawal CM, Micallef DM, Mabrey JD: “The Wear of Ultrahigh Molecular Weight Polyethylene,” in **Encyclopedic Handbook of Biomaterials and Bioengineering, Part A: Materials**. Wise DL, et al., eds., Marcel Dekker, New York, NY, July 1995, 1912 pages.
- f. Mabrey JD, Atesok K, Egol KA, Jazrawi L: “Orthopaedic Simulation,” in **The Comprehensive Textbook of Healthcare Simulation**, Levine AI, Demaria S, Schwartz AD (eds), Springer, New York, NY, 2012.

4. Media and Software Developed:

- a. 2002 Update on Virtual Reality of the Knee - with Wendy Rigby, KENS5
- b. 2001 Metal on Metal Total Hip Replacement - with Wendy Rigby, KENS5
- c. 2001 Hip Arthroscopy - with Wendy Rigby, KENS5
- d. 2000 Virtual Knee Simulator - with Wendy Rigby, KENS5
- e. 1999 The Arthritic Knee – AAOS CD-ROM
- f. 1998 Orthopaedic Grand Rounds – The Shoulder – CD-ROM
- g. 1998 Low Contact Stress Total Knee - with Wendy Rigby, KENS5
- h. 1996 AAOS Hip and Knee Special Interest Examination
- i. 1995 AAOS Orthopaedic Grand Rounds - CD-ROM: The Shoulder
- j. 1994 Surgical Technique Videotape - Implantation of the Osteoport
- k. 1994 Surgical Technique Videotape - Uncemented total hip arthroplasty
- l. 1994 Virtual Reality and the Future of Medicine - Videotape
- m. 1993 The Future of Telemedicine in South Texas - Videotape
- n. 1995 Total Hip Arthroplasty at UTHSCSA - with Wendy Rigby, KENS5
- o. 1995 Patient education video - “Introduction to total knee arthroplasty for patient at University Hospital” (English and Spanish)
- p. 1995 Patient education video - “Introduction to total hip arthroplasty for patients at University Hospital” (English and Spanish)

D. Educational Supervision:

1. Rotation Students Supervised:

Brad Chesney - MS I - UTHSCSA - Summer 1994

“Isolation of UHMWPE wear particles”

“Interspecies comparison of a bone fracture toughness model.”

Ramesh Rao - MS I - UTHSCSA - Summer 1994

“Three dimensional imaging of complex acetabular defects.”

Dawn Jaroszewski - MS I - UTHSCSA -1994-1995

“Isolation of UHMWPE wear particles”

“Comparison of the effects of various chemical isolation techniques and their effect on polyethylene particles”

Tiffany Medlin - MS II - UTHSCSA - 1995

“Spanish language patient education videos for patients undergoing total knee or total hip arthroplasty.”

2. Post-doctoral Students Supervised:

Nusret Kose, M.D. - August, 1996 to November, 1996

“Effect of Cortical Defects on Uncemented Femoral Stem Bypass”

“Set Screw Fixation of Intramedullary Femoral Rods”

“Total Hip Arthroplasty in Proximal Femoral Focal Deficiency”
Techniques in Total Joint Replacement

Nithyanand S. Masilamani, M.D. - September, 1994 to July, 1995

“Total joint database system”

“Isolation of UHMWPE particles”

“Fracture toughness of human cortical bone as a function of age”

Carlos Gonzales, M.D. - January, 1995 to July, 1995

Techniques in total joint replacement

III. RESEARCH

A. Bibliography:

1. Books and/or chapters:

- a. Mabrey JD, Otis JC: "Lower Extremity Function in Patients with Rheumatoid Arthritis," in **Surgical Treatment of Rheumatoid Arthritis** Sculco TP, ed. Mosby-Year Book, Inc., St. Louis, 1992.
- b. Agrawal CM, Micallef DM, Mabrey JD: “The Wear of Ultrahigh Molecular Weight Polyethylene,” in **Encyclopedic Handbook of Biomaterials and Bioengineering, Part A: Materials**. Wise DL, et al., eds., Marcel Dekker, New York, NY, July 1995, 1912 pages.
- c. Mabrey JD: “Bones, Muscles, and Joints,” in **The New Book of Knowledge: Health and Medicine Annual, 1995**. Castagno JM, ed., Grolier Incorporated, 1995.
- d. Mabrey JD, Trick L: “Surgical Approaches to the Hip.” in **Contemporary Extensile Exposures in Orthopaedic Surgery**, Williams RP and Heckman JD(eds). *Williams & Wilkins*, Baltimore, 1996..
- e. Mabrey JD: “Periprosthetic Fractures in the Lower Extremities,” in **Fractures in Adults - Fourth Edition**, Rockwood CA, Green DP, Bucholz RW, and Heckman JD (eds), 1996 - J.B. Lippincott, Philadelphia, PA.

- g. Mabrey JD: "Bones, Muscles, and Joints," in **The New Book of Knowledge: Health and Medicine Annual, 1996**. Castagno JM, ed., Grolier Incorporated, 1996.
- h. Mabrey JD: "Periprosthetic Fractures in the Lower Extremities," in **Fractures in Adults - Fifth Edition**, Rockwood CA, Green DP, Bucholz RW, and Heckman JD (eds), 2001 - J.B. Lippincott, Philadelphia, PA.
- i. Mabrey JD: "Fractures of the Hip;" "Osteoporosis;" "Osteonecrosis;" "Dislocation of the Hip;" "Osteoarthritis;" "Rheumatoid Arthritis;" "Orthopaedic Imaging;" "Crystalline Arthropathies;" "NSAID's," in **Current Orthopedic Diagnosis**, Schenck R (ed), 2000 – Current Medicine, Inc., Philadelphia, PA
- j. Mabrey JD: "Periprosthetic Fractures of the Lower Extremities," in **Skeletal Trauma: Basic Science, Management, and Reconstruction, 3rd Edition**, Browner, Bruce D., Jupiter, Jesse B., Levine, Alan M., and Trafton, Peter G. (eds), 2003 - WB Saunders Co., Philadelphia, Pa, 2003.
- k. Mabrey JD: "Periprosthetic Fractures About Total Hip and Total Knee Replacements," in **Fractures in Adults - Sixth Edition**, Bucholz RW, Heckman JD, Court-Brown, CM (eds), 2006 – Lippincott Williams & Wilkins, Philadelphia, PA.
- l. Mabrey JD (guest ed): "Virtual Reality Symposium," in **Clinical Orthopaedics and Related Research**, Brand RA (ed), 2006;**442**:pp 1-73
- m. Kirschenbaum IH; Mabrey JD, et al: "The Electronic Medical Office: Optimizing Solutions," in **Instructional Course Lectures 2008**; 57:737-745 – American Academy of Orthopaedic Surgeons, Rosemont, IL
- n. Wolff LH, Berry D, Mabrey JD: "Periprosthetic Fractures of the Lower Extremities," in **Skeletal Trauma: Basic Science, Management, and Reconstruction, 4th Edition**, Browner, Bruce D., Jupiter, Jesse B., Levine, Alan M., and Trafton, Peter G. (eds), 2009 - Elsevier, Philadelphia, Pa, 2009.
- o. Mabrey JD, Atesok K, Egol KA, Jazrawi L: "Orthopaedic Simulation," in **The Comprehensive Textbook of Healthcare Simulation**, Levine AI, Demaria S, Schwartz AD (eds), Springer, New York, NY, 2012.

2. Papers published or in press:

- a. *Backus SI, Mabrey JD, Kroll MA, Warren RF, Otis JC: "Torque Production in the Shoulder of the Normal Young Adult Male." **Physical Therapy** 1985;**65**:715.
- b. Goldner JL, Hardaker WT, Mabrey JD: "Open Fractures of the Extremities: The Case for Open Treatment." **Post Graduate Medicine** 1985;**78**:199-214.
- c. *Mabrey JD, McCollum DE: "High Tibial Osteotomy: A Retrospective Review of 72 Cases." **Southern Medical Journal** 1987;**80**:975-980.
- d. *Mabrey JD, Fitch RD: "Plastic Deformation in Pediatric Fractures: Mechanism and Treatment." **Journal of Pediatric Orthopaedics** 1989;**9**:310-314.
- e. *Otis JC, Warren RF, Backus SI, Santner TJ, Mabrey JD: "Torque Production in the Shoulder of the Normal Young Adult Male: The Interaction of Function, Dominance, Joint Angle, and Angular Velocity." **American Journal of Sports Medicine** 1990;**18**:119-123.

- f. *Sayson SC, Ducey JP, Mabrey JD, Wesley RL, Vermillion D: "Sciatic Entrapment Neuropathy Associated with an Anomalous Piriformis Muscle." **Pain** 1994;**59**:149-152. (listed as Maybrey JB in NLM)
- g. *Smith W, Martin SL, Mabrey JD: "Use of a Supracondylar Nail for Treatment of a Supracondylar Fracture of the Femur Following Total Knee Arthroplasty." **The Journal of Arthroplasty**, 1996;11(2): 210-213.
- h. Priesmeyer HR, Sharp LF, Wammack L, Mabrey JD: "Chaos Theory and Clinical Pathways: A Practical Application." **Quality Management in Health Care**, 1996;4(4): 63-72.
- i. *Laurel Y, Mabrey JD: "Drug Sample Storage and Distribution in the University Health System." **Hospital Pharmacy**, 31(11), December, 1996.
- j. Mabrey JD: "Research Issues in Biomaterials: Osteolysis in Total Joint Arthroplasty." **Biomaterials Forum**, 1996;18(4): 9.
- k. *Kose N, Campbell R, Lored R, Wammack LA, Mabrey JD: "Total Hip Arthroplasty in an Adult with Proximal Femoral Focal Deficiency: A Case Report." **The Journal of Arthroplasty**, Vol. 12, December, 1997.
- l. *Mabrey JD, Toohey JS, Armstrong DA, Lavery L, Wammack LA: "Clinical pathway management of total knee arthroplasty." **Clinical Orthopaedics and Related Research**, Vol 345: pp 125-133, December, 1997.
- m. *Wammack LA, Mabrey JD: "Outcomes Assessment of Total Hip and Total Knee Arthroplasty: Critical Pathways, Variance Analysis, and Continuous Quality Improvement." **Clinical Nurse Specialist**, Vol. 12(3): pp 122-129, May, 1998.
- n. *Wang X, Masilamani NS, Mabrey JD, Alder ME, Agrawal CM: "Changes in the fracture toughness of bone may not be reflected in its mineral density, porosity, and tensile properties," **Bone**, Vol. 23, 1998
- o. *Wang X, Mabrey JD, Agrawal CM: "An interspecies comparison of bone fracture properties," **Biomedical Materials and Engineering**, Vol. 8, pp 1-9, 1998.
- p. *Dean DD, Schwartz Z, Liu Y, Blanchard CR, , Agarwal CM, Mabrey JD, et al.: "The Effect of UHMWPE Wear Particles on MG63 Osteosarcoma Cells In Vitro." **Journal of Bone and Joint Surgery (Am)**, Vol. 81A(4), pp 452-461, April, 1999.
- q. Mabrey JD, Meglan DA, Wolfe SW, An K-N: "Arthroscopic Simulator." **NIH/AAOS Workshop on New Engineering Technology Transfer in Orthopaedics**, Chao EYS, DiGioia AM, and Bargar WL (eds), Baltimore MD, April 30-May3, 1998.
- r. *Wirth MA, Agrawal CM, Mabrey JD, Dean DD, Blanchard CR, Miller, MA, Rockwood CA: "Isolation and Characterization of Polyethylene Wear Debris Associated with Osteolysis Following Total Shoulder Arthroplasty." **Journal of Bone and Joint Surgery (Am)**, Vol. 81A(1), pp 29-37, January, 1999.
- s. *Landry ME, Blanchard CR, Mabrey JD, Wang X, Agrawal CM: "Morphology of In vitro Generated Ultrahigh Molecular Weight Polyethylene Wear particles as a Function of Contact Conditions and Material Parameters." **Journal of Biomedical Materials Research**, Vol. 48(1), pp 61-69, Spring 1999.

- t. Lin J, Foote J, Lanctot D, Korvick D, Mabrey JD, Agrawal CM, Athanasiou K: Optimal Bypass Length of Femoral Cortical Defect in Cementless Hip Arthroplasty: An Experimental Study.” **Chin J Orthop**, 18(7), pp 418-422, 1998.
- u. *Poss R, Mabrey JD, Gillogly SD, Kasser JR, Sweeney HJ, Zarins B, Garrett WE, and Cannon WD: “Development of a Virtual Reality Arthroscopic Knee Simulator.” **Journal of Bone and Joint Surgery (Am)**, Vol. 82A(10), pp 1495-99, October, 2000.
- v. *Mabrey JD: “Electronic Resources for the Orthopaedic Surgeon.” **Journal of Bone and Joint Surgery (Am)**, Vol. 82A(10), pp 1499-1502, October, 2000.
- w. *Mabrey JD: “A Preliminary Survey of Patient-Oriented Total Hip Information Resources Available on the World Wide Web.” **Clinical Orthopaedics and Related Research**, 381, pp 106-13, December 2000
- x. *Kose N, Gunal I, Wang X, Athanasiou KA, Agrawal CM, Mabrey JD: “Setscrew distal locking for intramedullary nails: a biomechanical study.” **J Orthop Trauma** 14(6), pp 414-19, 2000.
- y. *Farnworth LR, Lemay DE, Wooldridge T, Mabrey JD, et al.: “A comparison of operative times in arthroscopic ACL reconstruction between orthopaedic faculty and residents: the financial impact of orthopaedic surgical training in the operating room.” **Iowa Orthop J** 21, pp 31-5, 2001
- z. *Mabrey JD, et al.:” Comparison of UHMWPE particles in synovial fluid and tissues from failed THA.” **J Biomed Mater Res**, 58(2), pp 196-202, 2001
- aa. *Mabrey JD, et al: “Standardized Analysis of UHMWPE Wear Particles from Failed Total Joint Arthroplasties.” **J Biomed Mater Res**, 63(5), pp 475-483, 2002
- bb. *Mabrey JD, et al: “Virtual Reality Simulation of Arthroscopy of the Knee.” **Arthroscopy**, 18(6), pp E28, 2002. (Web Version)
- cc. Mabrey JD: “Computers “Learn” to Take Dictation.” **American Academy of Orthopaedic Surgeons Bulletin**, 46(3), June, 1998.
- dd. Mabrey JD: “Digital Imaging: From Shoot to Show.” **American Academy of Orthopaedic Surgeons Bulletin**, 48(3), June, 2000.
- ee. Mabrey JD: “Convergence of Technologies: Mobile Devices put a Computer in Your Pocket.” **American Academy of Orthopaedic Surgeons Bulletin**, 50(2), April, 2002.
- ff. Cannon WD and Mabrey JD: “Virtual Reality Simulator – On Track to Reality.” **American Academy of Orthopaedic Surgeons Bulletin**, 50(6), December, 2002.
- gg. Mabrey JD: “A PDA Orthopaedic Library.” **American Academy of Orthopaedic Surgeons Bulletin**, 50(5), October, 2002.
- hh. Mabrey JD: “Is a Tablet PC in Your Future?” **American Academy of Orthopaedic Surgeons Bulletin**, 50(6), December, 2002.
- ii. Kinnaman K, Mabrey JD: “Arthroscopy of the Hip Joint: An Overview.” **Orthopaedic Nursing**, 25(2), pp 93-97, March/April, 2006.

- jj. Mabrey JD, Reinig KD, and Cannon WD: "Virtual Reality in Orthopaedics – Is It a Reality?" **Clin Orthop Relat Res**, 462, pp 2586-2591, 2010.
- kk. Covall DJ, Stulberg BN, Mabrey JD, Burstein AH, Angibaud LD, Smith K, Zadzilka JD: "Introducing a New Technique for Improving Predictability in Cruciate Retaining Total Knee Arthroplasty: The Posterior Cruciate Referencing Technique." **Techniques in Knee Surgery**. 8(4):271-275, December 2009.
- ll. Atesok K, Mabrey JD, Jazrawi LM, Egol KA: "Surgical Simulation in Orthopaedic Skills Training." **Journal of the American Academy of Orthopaedic Surgeons**. 20(7): 410-422, July 2012.

3. Abstracts:

- a. Mabrey JD, Everett MM, Liu Y, You S, Smith NK, Richardson A, Boyan BD: "Deficits in Rat Osteoblasts Cultured from Aged Fischer 344 Rats are Restored by Dietary Restriction." **Orthopaedic Research Society** - 1993.
- b. Gerwin M, Figgie MP, Mabrey JD, Inglis AE: "Results of Revision of Semi-constrained Total Elbow Replacements for Dislocation." **American Academy of Orthopaedic Surgeons** - 1993
- c. Arrington E, Mabrey JD, Jackson CS: "Acute Rhabdomyolysis After Excessive Exertional Effort in Army Soldiers." **Orthopaedic Transactions** 1993:17:499.
- d. Peterson, D, Mabrey JD: "Ilioinguinal Approach for Extraction of an Intraarticular Hip Bullet Associated with Colonic Contamination and Central Acetabular Fracture." **Orthopaedic Transactions** 1993:17:500.
- e. Mabrey JD, Agrawal CM, Lankford J, Campbell J, Campbell PA, Schmalzried TP: "Atomic Force Microscopy of Sub-Micron Ultra High Molecular Weight Polyethylene Wear Particles Isolated from *In Vitro* and *In Vivo* Sources." **Proceedings of the 4th Annual Conference of the Australian Society of Biomaterials** - 1994.
- f. Arrington ED, Mabrey JD, Bucknell AL: "Uncemented Total Hip Arthroplasty in Patients 65 Years of age and Older Utilizing a Proximal/Distal Modular Hip System." **Orthopaedic Transactions** 1994: 18: 906.
- g. Mabrey JD, Lankford J, Blanchard C, Agrawal CM: "Application of Atomic Force Microscopy Toward Imaging Sub-micron Ultra High Molecular Weight Polyethylene Wear Particles Isolated from In Vitro and In Vivo Sources." **Proceedings of the 21st Annual Meeting of the Society for Biomaterials**, March 18-22, 1995.
- h. Mabrey JD and Merril, JR: "Development of the Virtual Knee for Orthopaedic Training and Research." **Proceedings of Virtual Reality in Medicine and Developer's Expo**, June 1-4, 1995, Virtual Reality Solutions, Inc., New York, NY.
- i. Jacobs PM, Williams RP, Mabrey JD: "Segmental Skeletal Replacement for Periprosthetic Fractures about the Knee in Debilitated Patients." **Orthopaedic Transactions**. 1995: 19:812.
- j. Mabrey JD and Wammack LA: "Treatment of periprosthetic Fractures of the Hip and Knee." **Orthopaedic Transactions**. 1995: 19:825.

- k. Landry ME, Mabrey JD, Pellerin J, Ho PS, Dean DD, Agrawal CM: "Osteolysis in Total Hip Arthroplasty (THA): Fractal Image Analysis of Retrieved In Vitro and In Vivo Sub-Micron Polyethylene Wear Particles." **Final Program of the Annual Meeting of the American Academy of Orthopaedic Surgeons**, February 22-26, 1996, Atlanta, GA.
- l. Mabrey JD, Merril GL, Millman AS, Merril JR: "Virtual Reality Simulation of Arthroscopy of the Knee." **Final Program of the Annual Meeting of the American Academy of Orthopaedic Surgeons**, February 22-26, 1996, Atlanta, GA.
- m. Wang X, Parachuru S, Mabrey JD, Agrawal CM: "An Interspecies Study of Bone Fracture Toughness." **Transactions of the 42nd Annual Meeting of the Orthopaedic Research Society**, February 18-22, 1996, **21**(2), p 595.
- n. Mabrey JD, Dean DD, Schwartz Z, Szygenda DM, Jaroszewski DE, Landry M, Miller M, Alderete M, Pellerin J, Ho PS, Boyan BD, Agrawal CM: "Visualization of Detailed Surface Morphology of Retrieved In Vivo Polyethylene Wear Particles with Atomic Force Microscopy." **Transactions of the 42nd Annual Meeting of the Orthopaedic Research Society**, February 18-22, 1996, **21**(2), p 466.
- o. Wammack LA, Mabrey JD: "Meaningful Representation of Outcomes Data: Use of Basic Computer Tools in the Analysis and Presentation of Outcomes Management Data. (poster)" **Outcomes Management: Charting the Course for Best Practice**, Third Annual Symposium, Houston, TX April 25-26, 1996.
- p. Landry ME, Jaroszewski DE, Szygenda DM, Mabrey JD, Blanchard C, Agrawal CM: "Numerical Particle Analysis of Individual UHMWPE Particles." **Proceedings of the Fifth World Biomaterials Congress**, Toronto, Canada, May 29-June 2, 1996, p 853.
- q. Mabrey JD, Merril GL, Millman AS, Merril JR: "Virtual Reality Simulation of Arthroscopy of the Knee." **Orthopaedic Transactions**, 20(1), 1996, p. 171.
- r. Landry ME, Mabrey JD, Pellerin J, Ho PS, Dean DD, Agrawal CM: "Osteolysis in Total Hip Arthroplasty: Fractal Image Analysis of Retrieved In Vitro and In Vivo Sub-Micron Polyethylene Wear Particles." **Orthopaedic Transactions**, 20(1), 1996, p. 223.
- s. Mabrey JD, Kose N, Wang X, Lanctot D, Jaroszewski D, Athanasiou K, Agrawal CM. "Smooth Uncemented Femoral Stems Do Not Provide Torsional Stability of Femurs with Cortical Defects." **Proceedings of the 17th Southern Biomedical Engineering Conference**, San Antonio, Texas, February 6-8, 1998, p 57.
- t. Dean DD, Lohmann CH, Alderete M, Sylvia VL, Agrawal CM, Blanchard C, Mabrey JD, Schwartz Z, Boyan BD: "Human Hip Wear Debris Particles Affect Proliferation, Differentiation, and Local Factor Production by MG63 Osteoblast-like Cells *In Vitro*." **Transactions of the 24th Annual Meeting of the Society for Biomaterials**, April 22-26, 1998, San Diego, p 57.
- u. Mabrey JD, Wirth MA, Blanchard C, Huang D, Dean DD, Athanasiou KA, Agrawal CM: "Comparison of UHMWPE Particles Isolated from Total Shoulder and Total Hip Revision Arthroplasties." **Transactions of the 24th Annual Meeting of the Society for Biomaterials**, April 22-26, 1998, San Diego, p 310.
- v. Mabrey JD, Huang D, Wang X, Athanasiou KA, Agrawal CM: "Effects of Sterilization on the Size and Morphology of In Vitro Generated UHMWPE Wear Particles." **Transactions of the 24th Annual Meeting of the Society for Biomaterials**, April 22-26, 1998, San Diego, p 313.

- w. Nalty T, Karlin C, Hardy C, Wilson L, Sanders C, Mabrey JD: "Use of the Tinetti Gait and Balance Scores for total Knee Arthroplasty Patients." **Texas Physical Therapy Association**, April 24-25, 1998, Houston.
- x. Wirth MA, Huang D, Dean DD, Agrawal CM, Mabrey JD: "Characterization of Polyethylene Wear Debris Associated with Osteolysis about Failed Total Shoulder Arthroplasties." **American Shoulder and Elbow Surgeons**, March 22, 1998, New Orleans.
- y. Mabrey JD, Foote J, Kose N, Wang X, Lancot D, Jaroszewski D, Athanasiou K, Agrawal CM: "Smooth Uncemented Femoral Stems Do Not Provide Torsional Stability of Femurs with Cortical Defects." **Orthopaedic Transactions**, 22(1), pp 236-237, 1998.
- z. Mabrey JD; Rathjen KW; Schubert RD; Baum, BS; Pollo, FE: "Hip Kinematics and Kinetics in Walking and Stair Ascent/Descent in Patients with Reduced Incision Total Hip Arthroplasty." **Orthopaedic Research Society**, March 19, 2006, Chicago, IL.
- aa. Mabrey JD; Rathjen KW; Schubert RD; Baum, BS; Pollo, FE: "Hip Kinematics and Kinetics in Walking and Stair Ascent/Descent in Patients with Reduced Incision Total Hip Arthroplasty." **Texas Orthopaedic Association**, May 4, 2006, Houston, TX.
- bb. Covall DJ, Stulberg B, Mabrey JD: "Early Results of the Posterior Cruciate Referencing Technique and Posterior Sloped Tibial Inserts on Total Knee Arthroplasty." **International Society for Technology in Arthroplasty – 22nd Annual Congress 2009**. Hawaii, USA. October 22-24, Hawaii, USA.
- cc. Angibaud LD, Stulberg BN, Mabrey JD, Covall DJ, Steffens J, Hayes A, Weisenburger J, Haider H: "Effects of Tibial Insert Slope on Polyethylene Wear." **International Society for Technology in Arthroplasty – 22nd Annual Congress 2009**. Hawaii, USA. October 22-24, Hawaii, USA.
- dd. Stulberg BN, Covall DJ, Mabrey JD, Burstein AH, Angibaud LD, Smith K, Zadzilka JD: "Re-thinking Cruciate Retention in Total Knee Arthroplasty: Introduction of a New Technique for Functional Posterior Cruciate Retention in TKA." **International Society for Technology in Arthroplasty – 22nd Annual Congress 2009**. Hawaii, USA. October 22-24, Hawaii, USA.
- ee. Stulberg BN, Covall DJ, Mabrey JD, Burstein AH, Angibaud LD: "Effects of Tibial Insert Slope on Polyethylene Wear." **Mid-America Orthopaedic Association 28th Annual Meeting**, Austin, Texas, April 2010.
- ff. Covall DJ, Stulberg BN, Mabrey JD, Burstein AH, Angibaud LD, Smith K, Zadzilka JD. "Improving Predictability in Cruciate Retaining Total Knee Arthroplasty." **Mid-America Orthopaedic Association 28th Annual Meeting**, Austin, Texas, April 2010.
- gg. Covall DJ, Stulberg BN, Mabrey JD, Burstein AH, Angibaud LD. "Early Results with the Posterior Cruciate Referencing Technique and Posterior Sloped Tibial Inserts in Total Knee Arthroplasty." **Mid-America Orthopaedic Association 28th Annual Meeting**, Austin, Texas, April 2010.
- hh. Stulberg BH, Covall DJ, Mabrey JD, Burstein AH, Angibaud LD, Smith K, Zadzilka JD: "The Posterior Referencing Technique: A New Technique for Predictable PCL Preservation in CR TKA." **Knee Society Meeting**, Mayo Clinic Rochester, MN, September 8-10, 2010

- ii. Covall DJ, Stulberg BN, Mabrey JD, Burstein AH, Angibaud LD: "Impact of the Posterior Cruciate Referencing Technique and Posterior Sloped Tibial Inserts on Cruciate-Retaining Total Knee Arthroplasty: Two Year Results." **European Federation of National Associations of Orthopaedics and Traumatology**, June 1-4, 2011, Copenhagen, Denmark
- jj. Stulberg BN, Covall DJ, Mabrey JD, Burstein AH, Angibaud LD, Smith K, Zadzilka JD: "The Posterior Cruciate Referencing Technique: A New Technique for Predictable PCL Preservation in CR TKA." **European Federation of National Associations of Orthopaedics and Traumatology**, June 1-4, 2011, Copenhagen, Denmark
- kk. Angibaud LD, Stulberg BN, Mabrey JD, Covall DJ, Steffens J, Hayes A, Weisenburger J, Haider H: "Effects of Tibial Insert Slope on Polyethylene Wear." **European Federation of National Associations of Orthopaedics and Traumatology**, June 1-4, 2011, Copenhagen, Denmark

4. Review, editorials:

KEY TECHNIQUES IN ORTHOPAEDIC SURGERY, STEVEN H. STERN, MD (EDITOR), NEW YORK, THIEME, 2001, 352 PAGES; FOR **JOURNAL OF MUSCULOSKELETAL PAIN**, 2001.

Editorial Reviews

2012-Present	The Knee (Online Journal), Associate Editor
1995-2010	Journal of Bone and Joint Surgery, American , Associate Reviewer
1996-1998	Journal of Trauma , Reviewer
1998-2010	Journal of Arthroplasty , Reviewer
2001-2008	The International Journal for Quality in Health Care , Reviewer
2002-2009	The Journal of the American Academy of Orthopaedic Surgeons
2002-Present	Clinical Orthopaedics and Related Research
2004-2009	The Journal of Information Technology in Health Care
2004-2010	Technical Editor, Orthopaedic Knowledge Online
2005-2010	Associate Editor – Adult Reconstruction, OKO

Editor: "Virtual Reality in Orthopaedics," **Clinical Orthopaedics and Related Research**, vol 442, Jan. 2006.

5. Other:

International Presentations

- a. "Atomic Force Microscopy of Sub-Micron Ultra High Molecular Weight Polyethylene Wear Particles Isolated from *In Vitro* and *In Vivo* Sources."
- **4th Annual Conference of the Australian Society for Biomaterials**. Sydney, Australia, 1994
- b. "Infecciones en artroplastias totales."
- **XXIII Curso Anual de la Sociedad de Ortopedia y Traumatologia de Nuevo Leon, AC. Nuevos Conceptos en Reemplazos de Rodilla y Cadera.**, Monterrey, Nuevo Leon, Mexico, 1994.
- c. "Osteolisis."
- **XXIII Curso Anual de la Sociedad de Ortopedia y Traumatologia de Nuevo Leon, AC. Nuevos Conceptos en Reemplazos de Rodilla y Cadera.**, Monterrey, Nuevo Leon, Mexico, 1994.
- d. "Osteolysis in Total Joint Arthroplasty."

- **Current Trends in Knee and Hip Arthroplasty** - Smith Nephew Richards, Cabo San Lucas, Mexico, June 25, 1994.
- e. "Indications and Usage of a Modular Femoral Component in Complex Revision Arthroplasty of the Hip."
- **Current Trends in Knee and Hip Arthroplasty** - Smith Nephew Richards, Cabo San Lucas, Mexico, June 25, 1994.
- f. "The Classification and Treatment of Periprosthetic Fractures Following Total Hip Arthroplasty."
- **Current Trends in Hip and Knee Arthroplasty** - Smith and Nephew Richards, Cabo San Lucas, Mexico, June 15, 1995.
- g. "Management of Fractures Around Total Knee Arthroplasties."
- **Current Trends in Hip and Knee Arthroplasty** - Smith and Nephew Richards, Cabo San Lucas, Mexico, June 16, 1995.
- h. "Virtual Reality Simulation in Arthroscopic Knee Surgery."
International Society of Arthroscopy, Knee Surgery and Orthopaedic Sports Medicine, Annual Meeting, Washington, DC, May 31, 1999.
- i. "Development of the Virtual Reality Arthroscopic Knee Simulator."
Arthroscopy Association of North America, Annual Meeting, Vancouver, Canada, April 29, 1999.
- j. "Hip Arthroscopy."
XI. Narodni Kongres CSOT, Annual Meeting of the Czech Orthopaedic Congress, Brno, Czech Republic, April 26, 2007.
- k. "Hip Resurfacing."
XI. Narodni Kongres CSOT, Annual Meeting of the Czech Orthopaedic Congress, Brno, Czech Republic, April 26, 2007.
- l. "Vertical Separation Distance of the Bony Insertions of the Posterior Cruciate Ligament as a Function of the Posterior Tibial Slope - An MRI Study."
Deutscher Kongress fur Orthopadie and Unfallchirurgie (DKOU) in Berlin, Germany, on October 23, 2009.
- m. "Effect of Varying Posterior Tibial Slopes on Intra-operative Passive Flexion in Total Knee Arthroplasty."
Deutscher Kongress fur Orthopadie and Unfallchirurgie (DKOU) in Berlin, Germany, on October 23, 2009.
- n. "Surgical Simulation in Orthopaedics – Next Steps Toward Integration into the Orthopaedic Curriculum."
International Society of Arthroscopy, Knee Surgery and Orthopaedic Sports Medicine (ISAKOS) in Toronto, Canada, on May 14, 2013.

National

- a. "Deficits in Rat Osteoblasts Cultured from Aged Fischer 344 Rats are Restored by Dietary Restriction."
- **Orthopaedic Research Society**, Washington, D.C., 1993

- b. "Clinical and Radiologic Evaluation of Total Hip Arthroplasty Utilizing Modular Porous Ingrowth Pads."
- **Smith Nephew Richards**, Pinehurst, North Carolina 1992.
- c. "The Medical Battlefield of the Future: Application of Current and Future Technologies."
- **The United States Army Special Operations Command - Surgeon's Conference**.
Fort Bragg, North Carolina, 1992.
- d. "Foreign and Domestic Orthopaedic Trauma."
- **The United States Army Special Operations Command - Surgeon's Conference**.
Fort Bragg, North Carolina, 1993.
- e. "The Future of Telemedicine and Virtual Reality at The University of Texas Health Science Center at San Antonio."
- **COMMON Conference**, San Antonio, Texas, October 18, 1994.
- f. "Venous Thromboembolic Disease - Current Concepts in Prophylaxis."
- **Mid Central States Orthopaedic Society** - June 18, 1994, Steamboat Springs, Colorado.
- g. "Osteolysis in Total Joint Arthroplasty."
- **American Society of Metals**, Chicago, Illinois, 4 October, 1994
- h. "The Rationalization of Medicine: Telemedicine, Virtual Reality and the Future of Orthopaedic Education."
- **Academic Orthopaedic Society**, Boston, Massachusetts, 29 October, 1994.
- i. "Application of Atomic Force Microscopy Toward Imaging Sub-micron Ultra High Molecular Weight Polyethylene Wear Particles Isolated from In Vitro and In Vivo Sources."
- **Society for Biomaterials**, 21st Annual Meeting, San Francisco, California, March 18-22, 1995.
- **Grand Rounds - The Hospital for Special Surgery**, New York, NY, July 18, 1995.
- **Clinical Orthopaedic Society**, San Antonio, TX, October 5, 1995
- j. "Development of the Virtual Knee for Orthopaedic Training and Research."
- **Virtual Reality in Medicine and Developer's Expo**, June 1-4, 1995, New York, NY.
- k. "The Operative Treatment of Periprosthetic Fractures."
- **Clinical Orthopaedic Society**, San Antonio, TX, October 7, 1995.
- l. "Computerized Databases for Orthopaedic Surgeons."
- **American Academy of Orthopaedic Surgeons**, Instructional Course Lecture, Atlanta, Georgia, February 22-26, 1996.
American Academy of Orthopaedic Surgeons, Instructional Course Lecture, San Francisco, California, February 13-17, 1997.
American Academy of Orthopaedic Surgeons, Instructional Course Lecture, Anaheim, California, February 4-8, 1999.
American Academy of Orthopaedic Surgeons, Instructional Course Lecture, New Orleans, Louisiana, March 20, 1998.
American Academy of Orthopaedic Surgeons, Instructional Course Lecture, Orlando, Florida, March 15-19, 2000

- m. "Development of the Virtual Knee for Simulation of Arthroscopy."
- **American Academy of Orthopaedic Surgeons**, Scientific Exhibit, Atlanta, Georgia, February 22-26, 1996.
- n. "Periprosthetic Fractures and Management."
in: "Revision Hip Surgery: Innovative Approaches;" **American Academy of Orthopaedic Surgeons**, Continuing Education Course, Rosemont, Illinois, November 14-16, 1997.
- o. "Update on the Electronic Office for Orthopaedic Surgeons."
American Association of Hip and Knee Surgeons, Dallas, TX, November 1998.
- p. "Update on the Electronic Office for Orthopaedic Surgeons."
American Academy of Orthopaedic Surgeons, Instructional Course Lecture, Anaheim, California, February 4-8, 1999.
- q. "Update on Electronic Mail and CD-ROM for Orthopaedic Surgeons."
American Orthopaedic Association, Invited Lecture, Sun Valley, Idaho, June 7, 1999.
- r. "The Modified Ganz Periacetabular Osteotomy for the Treatment of Symptomatic Hip Dysplasia in the Adult."
Clinical Orthopaedic Society, Traveling Fellow Lecture, Orlando, Florida, October 1, 1999.
- s. "Personal Digital Assistants (PDAs) in Orthopaedics."
American Academy of Orthopaedic Surgeons, Instructional Course Lecture 196, San Francisco, California, February 28, 2001.
American Academy of Orthopaedic Surgeons, Instructional Course Lecture 202, Dallas, Texas, February 14, 2002
American Academy of Orthopaedic Surgeons, Instructional Course Lecture, New Orleans, LA, 2003.
American Academy of Orthopaedic Surgeons, Instructional Course Lecture, San Francisco, CA, March 10, 2004
- t. "Virtual Reality of the Hip."
The Hip Society, Dallas, Texas, February 16, 2002
- u. "Hip Guidance Document Submission - Clinical Trial Design for Hip Replacement Systems."
FDA Orthopaedic and Rehabilitation Devices Panel, Gaithersberg, Maryland, June 3, 2004.
- v. "Clinical Overview of Hip Resurfacing Arthroplasty"
FDA Orthopaedic and Rehabilitation Devices Panel, Gaithersberg, Maryland, September 8, 2005.
- w. "Hip Kinematics and Kinetics in Walking and Stair Ascent/Descent in Patients with Reduced Incision Total Hip Arthroplasty"
Orthopaedic Research Society, Chicago, IL, March 19-20, 2006..
- x. "Hip Resurfacing Revisited – Update on the Birmingham Hip Resurfacing Prosthesis"
National Medical Association, Dallas, TX, August 8, 2006.

- y. Moderator: “Adult Reconstruction Hip – Alternative Bearing Surfaces, Papers 16-30.”
American Academy of Orthopaedic Surgeons, March 5, 2008, San Francisco, CA.
- z. “Leadership Skills in the Operating Room.” Instructional Course Lecture #268. **American Academy of Orthopaedic Surgeons**, February 8, 2012, San Francisco, CA.

State

- a. “Deficits in Rat Osteoblasts Cultured from Aged Fischer 344 Rats are Restored by Dietary Restriction.”
- **Texas Mineralized Tissue Society**, San Antonio, Texas, 1992.
- b. “The Geriatric Hip - Problems, Diagnosis, and Treatment.”
- **American Kinesiotherapy Association** - “Geriatrics: A Total Approach,” Wyndham Hotel, San Antonio, November 5, 1994.
- **Summer Intensive ‘95: Treating the Elderly Patient** - South Texas Geriatric Education Center, UTHSCSA, July 21, 1995.
- c. “Osteolysis in Total Joint Arthroplasty.”
- **Conference on Uncemented Total Joint Arthroplasty** - Office of Continuing Medical Education, UTHSCSA, San Antonio, Texas, April 29, 1994
- **Total Joint Arthroplasty** - Office of Continuing Medical Education, UTHSCSA, Horseshoe Bay, Texas, April 20, 1995
- d. “Custom Designed Acetabular Prostheses for the Reconstruction of Complex Bony Defects: Case Presentations and Review of Current Concepts.”
- **Texas Orthopaedic Association** - May 14, 1994, Austin, Texas.
- e. “Venous Thromboembolic Disease - Current Concepts in Prophylaxis.”
- **Texas Orthopaedic Association** - May 14, 1994, Austin, Texas.
- **Baton Rouge Orthopaedic Surgeons Association**- May 18, 1994, Baton Rouge, Louisiana.
- f. “Virtual Reality Simulation in Medicine.”
- **Health Line Texas - Radio Show** - Anne Wentworth - Texas Medical Association, July 29, 1994, Austin, Texas.
- g. “Computers, Telemedicine, and Virtual Reality - South Texas Medicine in the Fast Lane of the Information Superhighway.”
- **Texas Medical Association - Fall Leadership Conference**, Austin, Texas, September 17, 1994.
- h. “From Bones and Joints to Bits and Bytes: The Computerization of Orthopaedics.”
- **Texas Orthopaedic Association**, Dallas, May 20, 1995.
- i. “Controlling the Costs of Total Joint Arthroplasty.”
- **Texas Orthopaedic Association**, San Antonio, May 10, 1996.
- j. “Virtual Reality Simulation of Arthroscopic Surgery of the Knee.”
- **The University of Texas System Annual Telecommunications and Information Technology Conference**, The University of Texas at Brownsville and Texas Southmost College, Brownsville, TX, August 11-13, 1999

- k. "Electronic mail in the Orthopaedic practice: How to use it wisely and avoid getting burned."
Kentucky Orthopaedic Society, Annual Spring Meeting, Lexington, KY, February 24, 2001.
- l. "Voice recognition in Orthopaedics: Options available and will it work for you?"
Kentucky Orthopaedic Society, Annual Spring Meeting, Lexington, KY, February 24, 2001.
- m. "Personal digital assistants in medical practice: Will they work for you?"
Kentucky Orthopaedic Society, Annual Spring Meeting, Lexington, KY, February 24, 2001.
- n. "What your patients know about their total hip from the internet: Evaluation of medical, corporate, and private web sites."
Kentucky Orthopaedic Society, Annual Spring Meeting, Lexington, KY, February 24, 2001.
- o. "Building your personal web site: Options available and what information you should include."
Kentucky Orthopaedic Society, Annual Spring Meeting, Lexington, KY, February 24, 2001.
- p. "Digital imaging, the basics: How to create powerful PowerPoint slides, digitize radiographs, and collect digital video from your arthroscopies."
Kentucky Orthopaedic Society, Annual Spring Meeting, Lexington, KY, February 24, 2001.
- q. "Virtual Reality Arthroscopic Surgical Simulator: Report of the AAOS Task Force on Virtual Reality."
Kentucky Orthopaedic Society, Annual Spring Meeting, Lexington, KY, February 24, 2001.
- r. "Gluteus Medius Tears – Diagnosis and Treatment."
Texas Orthopaedic Society, Annual Spring Meeting, Grapevine, TX, April 24, 2010.

Local

- a. "Cruciate Sparing vs Cruciate Substituting Total Knee Replacement - A Functional Comparison Utilizing Motion Analysis"
- **Fellows Lecture Series**, The Hospital for Special Surgery, New York, New York, 1991
- **Laboratory for Clinical Investigation**, The Hospital for Special Surgery, New York, New York, 1991
- b. "Bipolar Arthroplasty of the Shoulder - Design Rationale and Clinical Applications"
- **Department of Biomechanics**, The Hospital for Special Surgery, New York, New York, 1991
- c. "Biomaterials - Current Concepts"
- **Brooke Army Medical Center**, Fort Sam Houston, Texas, 1991
- d. "Biomechanics - Current Concepts"
- **Brooke Army Medical Center**, Fort Sam Houston, Texas, 1991

- e. "Identification and Treatment of Infected Total Hip Arthroplasties"
- **Brooke Army Medical Center**, Fort Sam Houston, Texas, 1991
- f. "Compartment Syndrome - Identification and Treatment"
- **Brooke Army Medical Center** - Fort Sam Houston, Texas, 1991
- g. "Introduction to Total Hip Arthroplasty."
- **Department of Nursing**, UTHSCSA , 1993
- h. "Osteonecrosis of the Femoral Head - Review of Current Concepts and Treatment."
- **Orthopaedic Grand Rounds**, Department of Orthopaedics, UTHSCSA, 1992, 1993.
- i. "Atomic Force Microscopy of Retrieved and *In Vitro* Wear Particles."
- **Center for the Enhancement of the Bone Biomaterials Interface** Joint Industry Advisory Board Meeting, San Antonio, Texas, 1993
- **C. William Hall Seminar Series**. Southwest Research Institute, San Antonio, Texas, 1994
- j. "Total Knee Arthroplasty in Patients with Rheumatoid Arthritis."
- **Orthopaedic Grand Rounds**, Department of Orthopaedics, UTHSCSA, 1994
- k. "Atomic Force Microscopy of Sub-Micron Ultra High Molecular Weight Polyethylene Wear Particles Isolated from *In Vitro* and *In Vivo* Sources."
- **Scientific Session - Belgian Orthopaedic Traveling Fellows**. Department of Orthopaedics, UTHSCSA, 1994.
- **Scientific Session - Howmedica Visiting Scientists**. Department of Orthopaedics, Division of Research, Biomaterials Section, UTHSCSA, 1994.
- l. "Introduction to Total Hip Arthroplasty."
- **National Association of Orthopaedic Nurses**. Alamo Chapter, San Antonio, Texas, 1994
- m. "The Challenge of the Geriatric Hip"
in Scholars: A Seminar Series in Geriatrics & Gerontology.
- **South Texas Geriatric Education Center**, UTHSCSA. San Antonio, Texas, 1994, 1995.
- n. "The Geriatric Hip - Problems, Diagnosis, and Treatment."
- **Department of Physical Therapy**, Audie L. Murphy Veterans Affairs Medical Center, 1994.
- **Department of Physical Therapy**, University Hospital South Texas Medical Center, 1994
- o. "The Future of Telemedicine and Virtual Reality at The University of Texas Health Science Center at San Antonio."
- **Site Visit, State of Texas Legislative Staff**. Office of Public Affairs, UTHSCSA, San Antonio, Texas, 1994.
- p. "Virtual Reality Surgery."
- **Site Visit, Texas Medical Association**, Office of Public Affairs, UTHSCSA, San Antonio, Texas, 1994.

- q. "Ultra High Molecular Weight Polyethylene Particle Retrieval from In Vitro and In Vivo Sources."
- **Center the Enhancement of the Bone Biological Interface (CEBBI)** - Joint Industry Advisory Board Meeting, San Antonio, Texas, 1994
- r. "Custom Designed Acetabular Prostheses for the Reconstruction of Complex Bony Defects: Case Presentations and Review of Current Concepts."
- **North American Traveling Fellows**, Guest Lecture - October 20, 1994, UTHSCSA, Department of Orthopaedics
- s. "Deep Venous Thrombosis Prophylaxis after Orthopaedic Surgery."
- **Rhone-Poulenc-Rorer** - June 4, 1994, Joshua Creek Ranch, Texas
- t. "Retrieval Techniques for *In Vitro* and *In Vivo* UHMWPE Wear Particles."
- **Center for the Enhancement of the Bone Bio-materials Interface** - Joint Industry Advisory Board Meeting, San Antonio, Texas, 1994
- u. "Surgical Technique - Implantation of the Modular Uncemented Total Hip Arthroplasty."
- **University Hospital South Texas Medical Center - Live Video Conference**, Division of Orthopaedic Research, August 8, 1994.
- v. "Prevention and Treatment of Thrombophlebitis"
- **Department of Rehabilitation Medicine - Journal Review**, UTHSCSA, August 12, 1994.
- w. "Management of the Cost of Total Joint Arthroplasty: Results at University Hospital."
- **Bexar County Hospital District Board of Managers**, UTHSCSA, September 22, 1995.
- **UTHSCSA Clinical Chairs**, UTHSCSA, October 9, 1995.
- **Clinical Executive Board**, Audie L. Murphy VAMC, November 8, 1995.
- **Utilization Review Committee**, University Hospital, November 29, 1995.
- **Orthopaedic Grand Rounds**, Department of Orthopaedics, UTHSCSA, December 18, 1995.
- x. "Rehabilitation of Total Hip and Total Knee Arthroplasty"
- **Total Joint Replacement Seminar**, Total Joint Rehab, Inc., San Antonio, February 10, 1996.
- y. "Pathogenesis and Clinical Expression of Osteoarthritis"
- **Topics in Gerontology - Aging of the Musculoskeletal System**, UTHSCSA, February 29, 1996.
- z. "Wear in Total Knee Arthroplasty"
- **Orthopaedic Grand Rounds**, Department of Orthopaedics, UTHSCSA, November 25, 1996.
- aa. "Critical Pathways in Orthopaedic Surgery"
- **General Surgery Grand Rounds**, Department of Surgery, UTHSCSA, October 31, 1997.
- bb. "New Viable Therapies for Managing Osteoporosis"
- **20th annual Scholars Program in Geriatrics and Gerontology**, South Texas Geriatric Education Center, UTHSCSA, February 26, 1999.
- cc. "Latest Advances in Total Joint Replacement"

- **Baylor University Medical Center Educational Seminar**, Doubletree Hotel, Dallas, TX.
- May 16, 2006
- September 12, 2006
- January 23, 2007

ORTHOPAEDIC GRAND ROUNDS

- a. "Virtual Reality Simulation of Arthroscopic Surgery of the Knee."
Hartford Orthopaedic Forum Lecture, Hartford, Conn. September 23, 1999
University of Texas, Houston Health Science Center, Houston, Texas, April 13, 2000
University of Texas Southwest, Dallas, Texas, May 3, 2000
University of Texas Health Science Center at San Antonio, San Antonio, Texas, June 19, 2000
Vanderbilt University, Nashville, Tenn., June 27, 2000
Baylor University, Houston, TX, October 19, 2000
University of California, San Francisco, San Francisco, CA, November 15, 2006
Penn State University, Hershey, PA, March 27, 2008.
University of Texas Medical Branch, Austin, TX, May 21, 2008.
- b. "Periprosthetic Fractures – Classification and Treatment."
Hartford Hospital Lecture, Hartford, Conn. September 23, 1999
University of Texas Southwest, Dallas, Texas, May 3, 2000
- c. "Virtual Reality in Orthopaedic Surgery."
Lenox Hill Hospital, New York, NY. June 17, 2002
University of Kentucky, Lexington, KY, June 28, 2002
- d. "Update on Wear in Total Hips."
Baylor University, Houston, TX. September 11, 2002
- e. "Surface Replacement Arthroplasty."
Penn State University, Hershey, PA, March 27, 2008.

6. Papers submitted: n/a

B. Areas of Research Interest:

1. Virtual reality surgical simulation and remote telepresence surgery.
2. Case management and cost control of total joint arthroplasties.

C. Current Projects:

1. Cruciate-retaining sloped tibial insert development – Exactech
2. Surgical guidance systems for knee arthroplasty - Exactech

D. Research Support:

1. NATIONAL

Source: Department of Clinical Investigation, Brooke Army Medical Center, Grant # C 92-91

Title: Hormonal Influences on Cultured Osteoblasts from Mature and Senile

Rats
Period: 1991-1992
Total: \$9,000
Role: Principal investigator

Source: National Institutes of Health, Office of Extramural Research, Small Business Innovation Research Grant
Title: Development of a Virtual Reality Arthroscopic Surgical Simulator
Period: 2002-2004
Total: +\$750,000
Role: Consultant

Source: The Whitaker Foundation
Title: 17th Southern Biomedical Engineering Conference
Period: 08/01/1997-04/01/1998
Total: o\$11,000
Role: Co-Chair

Source: Howard Hughes Medical Institute
Title: 17th Southern Biomedical Engineering Conference in San Antonio
Period: 1/1/97-4/30/98
Total: o\$3,500
Role: Co-chair

2. UNIVERSITY

Source: Aging Research and Education Center
Title: Age dependent changes in the porosity, fluid content, and mineral density of baboon bone and their correlation with fracture properties
Period: 01/01/1996-12/31/1996
Total: o\$5,000
Role: Co-investigator

Source: Institutional Research Grant
Title: Reducing the wear of UHMWPE in total joint prostheses
Period: 09/01/1993-08/31/1994
Total: o\$8,000
Role: Co-investigator

Source: Ruth Jackson Research Fund
Title: Baylor Morton and Sports Performance Center
Period: 07/01/2004 – 06/30/2005
Total: o\$196,000
Role: Co-investigator

4. OTHER

Source: Kinetic Concepts International, San Antonio, Texas
Title: Radiographic Characterization of Relative Forefoot and Hindfoot Motion During Application of a Plantar Venous Plexus Compression Device
Period: 1993
Total: \$2,000
Role: Principal investigator

Source: Rhone Poulenc Rorer Pharmaceuticals (now Aventis)
Title: A Randomized Open-label Parallel Group Comparison of the Safety and Efficacy of Lovenox (enoxaparin) Injection vs. Adjusted Dose Coumadin (warfarin) in the Prevention of Thromboembolic Disease Following Total Hip Replacement
Period: 06/01/1994-12/31/1994
Total: **\$11,950**
Role: Principal investigator

Source: Smith+Nephew, Inc.
Title: Educational Research Grant: Computer-based Presentations
Period: 1996
Total: **\$9000**
Role: Principle Investigator

Source: Depuy Orthopaedics, Inc.
Title: Orthopaedic Bioengineering research agreement (Unrestricted support of Center for Clinical Bioengineering)
Period: 01/1/1998-12/31/2002
Total: o**\$900,000**
Role: Co-investigator

Source: Clinical Orthopaedic Society
Title: Travelling Orthopaedic Fellowship: Techniques in Pelvic Rotational Osteotomies
Period: 1999
Total: **\$6,000**
Role: Principal Investigator

Source: Searle/Pfizer
Title: Development grant for the AAOS CD-ROM "The Arthritic Knee"
Period: 1997-1998
Total: o**\$190,000**
Role: Co-author

Source: Ortho-Biotech
Title: Development grant for the AAOS CD-ROM "Blood Conservation in Total Joint Surgery"
Period: 1999
Total: o**\$50,000**
Role: Chairman, Committee on Electronic Media and Education

Source: Depuy Orthopaedics, Inc.
Title: Orthopaedic Research Nurse and Database Project
Period: 07/01/2000-06/30/2003
Total: **\$180,000** (\$60,000/year)
Role: Principal Investigator

Source: Pfizer Inc.
Title: Unrestricted orthopaedic education grant
Period: 2001
Total: **\$1500**
Role: Principal Investigator

Source: Searle/Pharmacia
Title: Unrestricted orthopaedic education grant
Period: 2002
Total: **\$5000**
Role: Principal Investigator

Source: Sanofi-Synthelabo US
Title: American Association of Hip and Knee Surgeons – 2002 Annual Meeting – Internet Kiosks
Period: 11/07/2002-11/09/2002
Total: **\$10,000**
Role: Chairman – Communications Committee

Source: Ruth Jackson Research Fund
Title: Upgrade of Baylor Motion & Sports Performance Laboratory
Period: 7/1/2004-12/31/2004
Total: **\$176,000**
Role: Co Principal Investigator with Dr. Fabian Pollo

IV. SERVICE

A. Professional Affiliations:

1. **Current Professional and Scientific Organizations and Societies:** *(Star {*} those that require election or examination for membership.)*

YEAR(S)	ORGANIZATION
1987 – 2010	Piedmont Orthopaedic Society
1989 – Present	American Board of Orthopaedic Surgery* (ABOS)
1991 – Present	American Academy of Orthopaedic Surgeons* (AAOS)
1992 – 2004	San Antonio Orthopaedic Association
1993 – 2010	Orthopaedic Research Society* (ORS)
1993 – Present	Texas Orthopaedic Association (TOA)
1993 – Present	Texas Medical Association (TMA)
1993 – 2004	Bexar County Medical Society
1993 – 2000	Orthopaedic Research and Education Foundation (OREF)
1993 – 2004	Alamo Orthopaedic Society
1993 – 2002	Association of VA Orthopaedic Surgeons
1995 – Present	American Association of Hip and Knee Surgeons* (AAHKS)
1996 – 2001	Clinical Orthopaedic Society* (COS)
1996 – 2001	Arthritis Foundation of South Texas
1998 – 2004	Society for Biomaterials
2000 – 2004	Adult Orthopaedic Reconstruction & Technique Association* (AORTA)
1995 – Present	Academic Orthopaedic Society* (AOS)
2004 - Present	Dallas County Medical Society

2. **Past and Current Positions and/or Offices Held in Professional Organizations:**

YEAR(S)	ORGANIZATION	POSITION/OFFICE
1994 – 1998	American Academy of Orthopaedic Surgeons - Audio Visual	Committee member

	Education Committee (Electronic Media Education)	
1998 – 2004*	Committee on Electronic Media and Education, AAOS	Chairman
1994 – 2000	AAOS Subcommittee on Hip, Knee and Adult Reconstruction	Committee member
1996*	Computer Boot Camp for orthopaedic surgeons, AAOS	Chairman
1995 – 2003	Committee on the Internet and the World Wide Web, AAHKS	Committee member
1996 – 2000	Committee on Research, AAHKS	Committee member
1996 – 2000	Committee on Hip and Knee Outcomes Databases, AAHKS	Committee member
1996 – 2000*	Arthritis Foundation – San Antonio Branch	Chairman
2004 – 2009*	Arthritis Foundation – Texas Chapter	Secretary
1997 – 2002*	Arthritis Foundation – South Texas Chapter	Medical Chairman
1997 – 1998*	Arthritis Foundation – South Texas Chapter	Vice-Chairman
1998 – 2004	Council on Education - AAOS	Committee member
1998 – 2009*	Taskforce on Virtual Reality Surgical Simulation – Council on Education, AAOS	Chairman
1998*	Taskforce on Arthroscopic Simulators, Technology Transfer in Orthopaedics, AAOS/NIH Workshop – Baltimore, April, 1998.	Chairman
2000 – 2001*	Arthritis Foundation – South Texas Chapter	Chairman

3. Other Professional Activities:

YEAR(S)	ORGANIZATION	ACTIVITY
1993-2004	Joint Effort for Arthritis	Founder and Director
1995, 1997 – 1999, 2001	A JOINT PARADE (San Antonio) walk-a-thon for orthopaedic research	Chairman
2002-2010	Orthopaedic and Rehabilitation Devices Panel of the Medical Devices Advisory Committee, Center for Devices and Radiologic Health, Food and Drug Administration	Panel member and now Chairman
2000-2007	American Academy of Orthopaedic Surgeons Capitol Hill Research Day, Committee on Research, requesting additional support for NIH National Institute of Arthritis and Musculoskeletal and Skin Diseases (NIAMS)	Congressional Lobbyist
2006-2010	Texas Orthopaedic Association, requesting additional support for Texas Orthopaedists	Congressional Lobbyist

4. Community Activities:

YEAR(S)	ORGANIZATION	POSITION/OFFICE
1993 – 1996	Math and Science Hotline Texas Society for Biomedical Research	
1987 – 1989	Bradwell High School Athletic Department, Hinesville, Georgia.	Team Physician
1986	Duke University Athletic Department, Durham, North Carolina	Team Physician
1997 – 2001	Troop 515, Alamo Chapter, Boy Scouts of America	Troop Physician
1996 – 2000*	Arthritis Foundation – San Antonio Branch	Chairman
1997 – 2002*	Arthritis Foundation – South Texas Chapter	Medical Chairman
1997 – 1998*	Arthritis Foundation – South Texas Chapter	Vice-Chairman

2000 – 2001*	Arthritis Foundation – South Texas Chapter	Chairman
2004 - 2009	Arthritis Foundation – Texas Chapter	Board member
2007 – Present	Medical Consultant to SMU School of Dance	Director

B. Patient Service:

1. Inpatient:

2006-Present	Medical Director – Joint Wellness Program, Baylor Univ. Med. Ctr.
1995-2004	Chief Joint Effort - Total Joint Critical Pathway Project
1993-1999	Staff Orange Service, University Hospital
1999-2004	Staff Green Service, University Hospital
2001-2004	Director Total Joint Service – Department of Orthopaedics
1993-1997	Staff Orthopaedic Service, Audie L. Murphy VAMC
1997-2002	Chief Orthopaedic Service, Audie L. Murphy VAMC
1991-1993	Staff Adult Reconstruction, Brooke Army Medical Center

2. Outpatient:

1993- 1999	Staff Orange Service, University Clinic Downtown
1999- 2004	Staff Green Service, University Clinic Downtown
1993- 2002	Staff Hip/Knee Clinic, Audie L. Murphy VAMC
1991-1993	Chief Hip/Knee Clinic, Brooke Army Medical Center

C. Committees:

1. Department

YEAR(S)	COMMITTEE	MEMBER/OFFICER
2002-2004*	Promotion and Tenure Committee	Chairman
1993-2004	Orthopaedic Residents Advisor Program (4 residents)	Staff
1994	Orthopaedic Research Seminar Series	Coordinator
1995-1999	Department of Orthopaedics Home Page (http://mabrey.uthscsa.edu/ortho2000/)	Director
1994-1998	Quality Assurance - UTHSCSA	Director

2. School

YEAR(S)	COMMITTEE	MEMBER/OFFICER
1996-2001*	Medical School Information Technology and Management Committee	Chairman
1995-1998	Admissions Committee, UTHSCSA, Medical School	Member
1995-1996	Information System Selection Committee (ISSC)	Member
1995-1996	ISSC Subcommittee on Managed Care	Member
1995*	Goal 6 - Strategic Planning Work Team	Chairman
1994-1998	Telemedicine Committee	Member
1993-2004	Medical Students Advisor Program (2 students per year)	Member
1994	Committee on Video Educational Support and Video Conferencing	Member
1994	Task Force to the University President to develop Telemedicine Program initiative for South Texas	Member
1994 - 1995	Medical Student Committee of the Liaison Committee on Medical Education	Member

3. University of Texas Health Science Center, San Antonio

YEAR(S)	COMMITTEE	MEMBER/OFFICER
2002-2004	Institutional Review Board	Member
1996-1997*	Subcommittee on Campus Wide Information System (CWIS) - Computing Resources Committee	Chairman
1995-1997	Computing Resources Committee (CRC)	Member
1996-1997	CRC Subcommittee on Future Directions	Member
1995-1996	CRC Committee on Investigator Resources	Member

4. University Hospital

1996	Advanced JCAHO Standards and Survey
1996-1999	Bloodless Surgery Committee
1996-1999	University Physicians Group Managed Care Committee
1996-1999	Medical Chart and Forms Committee
1995-1999	Utilization Review Committee
1995-1997	Clinical Privileges Committee
1995-1997*	Chairman, Orthopaedic Case Management Committee
1995-1997*	Chairman, Inpatient Electronic Chart Evaluation Committee
1993-2000	Drug Utilization and Evaluation Committee
1993-2000	Pharmacy and Therapeutics Committee
1993-1997	Patient Transfer Committee
1994	MRI Selection and Evaluation Committee
1994*	Chairman - P&T Subcommittee on Pharmaceutical Representatives
1994	DUE Subcommittee on Preoperative Antibiotics

5. Audie Murphy VA Medical Center

1997-2002	Chief – Orthopaedic Surgery Section
1995-2000	Liaison – Employee Health
1996-1997	Sub-Acute Care Task Force
1993-1994	PACT Program (Preservation Amputation Care and Treatment)
1994-2001	Orthopaedic Case Management Program
1994-1996	Drug Seeking Behavior Committee

6. Baylor University Medical Center, Dallas, TX

YEAR(S)	COMMITTEE	MEMBER/OFFICER
2004-Present	Medical Board, Baylor Univ. Med. Ctr (BUMC)	Member
2005-Present	Allied Health Professional Committee - BUMC	Member
2006-Present	Professional Standards Committee	Member
2004-Present	Quality Assurance Committee – Orthopaedics	Chairman
2004-Present	Clinical Transformation – Baylor Health Care System	Member
2005-Present	System Champion – Orthopaedic Order Sets	Chief
2005-Present	System Champion – VTE Prophylaxis	Member
2004- Present	Medical Director – Baylor Motion & Sports Performance Center	Director

D. Administrative Responsibilities:

1. Department, Division, Clinical Service, Coordinator, etc. (University Hospital):

1994	Establish guidelines for Orthopaedic Total Joint and Trauma Nurse Clinicians
1994	Establish selection criteria for bidding on total joint arthroplasties at University Hospital
1994	Evaluate Orthopaedic Database Software
1993 – 1994	Establish electronic mail system within department
1993 – 1994	Enhance library computer capabilities
1993	Coordinate Orthopaedic Department participation in University/McAllen telemedicine project
1995	Developed and designed “Rockwood Award for Student Excellence in Orthopaedics”
1996 – 1999	Establish and maintain web site for Department
2002 – 2004	*Chair – Promotion and Tenure Committee

2. Department, Division, Clinical Service, Coordinator, etc. (Baylor University Medical Center):

2004 - Present	Advisory Panel in Orthopaedics
2004 - 2011	Baylor Institute of Rehabilitation – Board Member
2004 - Present	Committee on Graduate Medical Education
2006 – Present	Professional Standards Committee
2005 – Present	Allied Health Committee
2006 – 2007	Workgroup on Spinal Surgery Gainsharing Project

3. Staff and Personnel Currently Supervised:

Executive Assistant – Orthopaedic Department

V. OTHER PERTINENT INFORMATION:

A. Regional Courses Developed

Texas Hill Country Total Hip, Knee, and Shoulder Meeting
Chairman
San Antonio, Texas, July 12-13, 2002.

Wear and its Consequences in Total Joint Arthroplasty
Co-chairman with Mauli Agrawal, Ph.D.
San Antonio, Texas, April 25-26, 1996.

Conference on Uncemented Total Hip Arthroplasty
Course Director and Chairman
San Antonio, Texas, April 29, 1994.

Texas Total Joint Round-up
Co-Chairman with Jeff Reuben, M.D., Houston, TX.
San Antonio, Texas, April 7-9, 1994.

B. Web Sites Developed or In Development

Dallasbonedoc: <http://www.youtube.com/user/dallasbonedoc1>