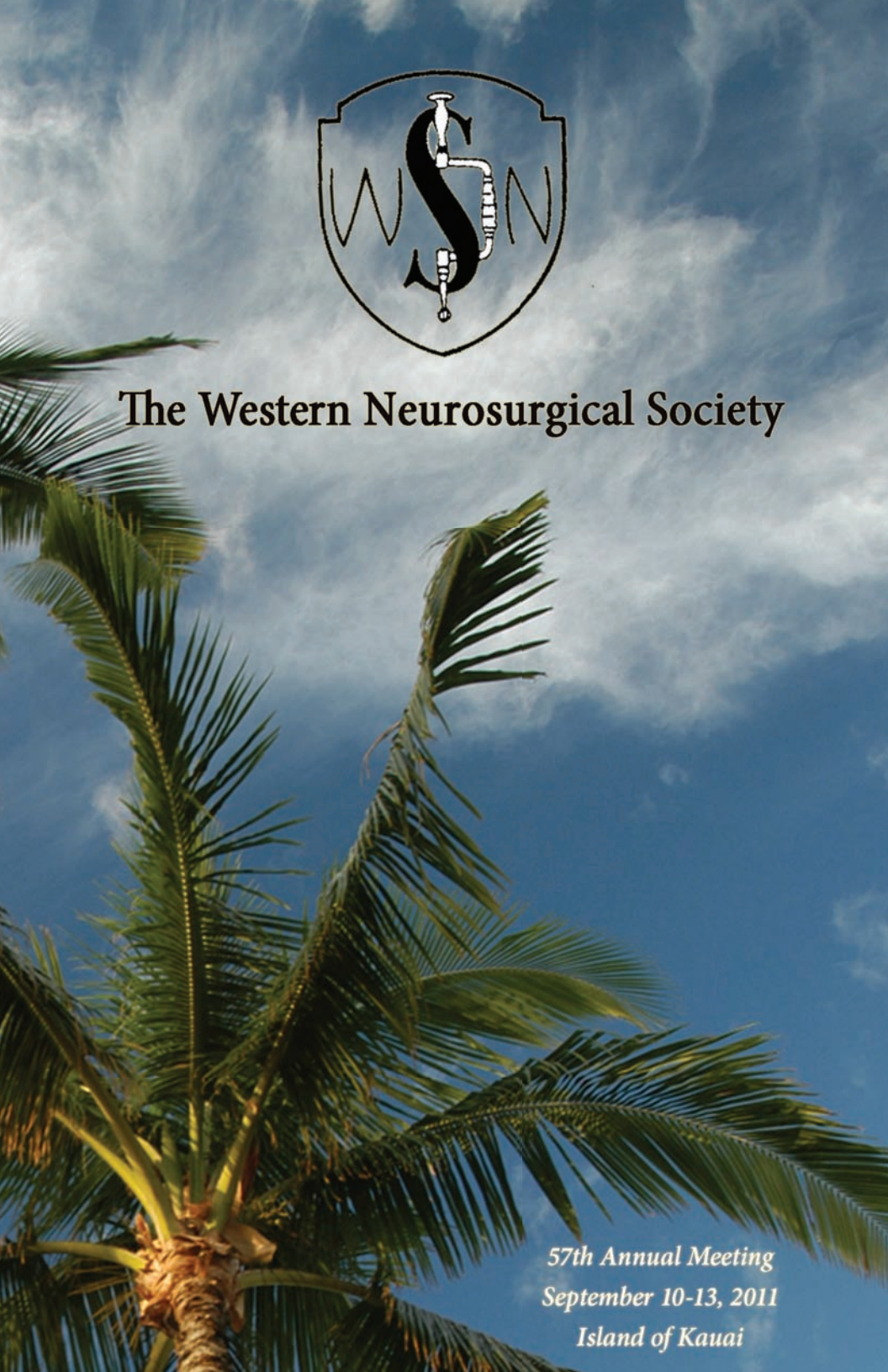

The Western Neurosurgical Society

57th Annual Meeting
September 10-13, 2011
Island of Kauai

CALENDAR OF EVENTS

Saturday, September 10, 2011

1:00PM-4:00PM	Executive Committee Meeting	Grand Boardroom
1:00PM-5:00PM	Registration	Grand Promenade
5:30PM-9:30PM	Opening Reception and Buffet	Ilima Garden

Sunday, September 11, 2011

6:00AM-7:00AM	Breakfast - Members / Professional Guests	Grand Ballroom 2
6:00AM-12:30PM	Exhibitors	Grand Ballroom 2
6:00AM-12:30PM	Registration	Grand Promenade
7:00AM-12:35PM	Scientific Session	Grand Ballroom 1
8:00AM-10:00AM	Breakfast - Spouses	Dondero's Restaurant
10:05AM-10:35AM	Break – Visit Exhibits	Grand Ballroom 2
1:00PM-6:00PM	Golf	Golf Course
1:00PM-5:00PM	Tennis	Tennis Courts
1:35PM-4:30PM	Horseback Beach Ride	CJM Country Stables
6:30PM-10:00PM	Beach Party	Shipwreck Lagoon

Monday, September 12, 2011

7:00AM-8:00AM	Members Business Meeting & Breakfast	Dondero's Restaurant
7:00AM-8:00AM	Breakfast - Professional Guests	Grand Ballroom 2
7:00AM-12:30PM	Exhibitors	Grand Ballroom 2
7:00AM-12:30PM	Registration	Grand Promenade
8:00AM-12:30PM	Scientific Session	Grand Ballroom 1
8:30AM-10:00AM	Breakfast - Spouses	Dondero's Restaurant
9:40AM-10:10AM	Break – Visit exhibits	Grand Ballroom 2
1:00PM-6:00PM	Golf	Golf Course
1:00PM-5:00PM	Tennis	Tennis Courts
1:00PM-5:30PM	Waimea Canyon Bike Ride	Outfitters Kauai
6:00PM-7:00PM	Formal Reception	Grand Garden
7:00PM-10:00PM	Formal Banquet / Dance	Grand Ballroom 3

Tuesday, September 13, 2011

6:00AM-7:00AM	Breakfast - Members / Professional Guests	Grand Ballroom 2
6:00AM-12:00PM	Exhibitors	Grand Ballroom 2
6:00AM-12:00PM	Registration	Grand Promenade
7:00AM-12:00PM	Scientific Session	Grand Ballroom 1
8:00AM-10:00AM	Breakfast - Spouses	Dondero's Restaurant
9:30AM-10:00AM	Break – Visit Exhibits	Grand Ballroom 2
12:00 PM	Scientific Meeting Adjourned	

See you at the 58th Meeting of the WNS
September 7-10, 2012
Broadmoor Hotel, Colorado Springs, CO

Western Neurosurgical Society

57th Annual Meeting

Grand Hyatt Kauai Resort & Spa

Island of Kauai, Hawaii

2011 Learning Objectives

The purpose of this meeting is to provide an update in the basic and clinical sciences underlying neurosurgical practice through lectures, discussions, interactive sessions with neurological surgeons, neurologists, neuroradiologists, and other allied health personnel.

Upon completion of this program, participants should be able to:

- Discuss current trends in the patient safety movement and how these impact neurosurgical practice.
- Review the expanded role of radiosurgical techniques in the treatment of CNS disorders, especially tumors of the CNS.
- Analyze options and outcomes for patients in whom spinal surgery may be a treatment option.

Jointly sponsored by

American Association of Neurological Surgeons

Notes

Hawaii

50th State admitted to the union on August 20, 1959

When measured from east to west, Hawaii is the widest state in the United States

Hawaii is the most isolated population center on Earth. It is 2,390 miles (3,850 km) from California, 3,850 miles (6,195 km) from Japan and 4,900 miles (7,885 km) from China.

The Western Neurosurgical Society
2011 Officers and Committees

OFFICERS

President - Austin R.T. Colohan, MD
President Elect - John Bonner, MD
Vice President - J. Paul Muizelaar, MD, PhD
Historian - Randall Smith, MD
Secretary-Treasurer - Charles Nussbaum, MD
Past President - David Newell, MD

COMMITTEES

Program
J. Peter Gruen, MD, Chairman
Charles Nussbaum, MD
Thomas Scully, MD
Javed Siddiqi, MD, PhD

Membership
Thomas Scully, MD, Chairman
Robert Hood, MD
Javed Siddiqi, MD, PhD
Larry Tice, MD

Awards
John Bonner, MD, Chairman
David Newell, MD
Lawrence Shuer, MD
Gerald Silverberg, MD
Randall Smith, MD

Site Selection
Jeffery Rush, MD, Chairman
James Ausman, MD
Grant Gauger, MD
John Kusske, MD
David Pitkethly, MD

Web Master
Randy Smith, MD, Chairman

By-Laws
Richard Wohns, MD, Chairman
Moustapha Abou-Samra, MD
Deborah Henry, MD

Audit
Marshal Rosario, MD, Chairman
Ben Blackett, MD
Tim Steege, MD

Nominating
David Newell, MD, Chairman
W. Ben Blackett, MD
J. Paul Muizelaar, MD, PhD
Lawrence Shuer, MD
John Slater, MD

Local Arrangements
Charles Nussbaum, MD, Chairman
J. Paul Muizelaar, MD, PhD
Tom Scully, MD

CME
Charles Nussbaum, MD, Chairman
J. Peter Gruen, MD

Thank You to the following exhibitors for their generous support of the meeting.

Thank You to the following exhibitors for their generous support of the meeting

Special Guest Lecturer

Clark Little
2010 Oceans Photography Award Winner

Clark Little was born in Napa, California in 1968. Two years later, a move to the North Shore of Oahu (Hawaii) dramatically changed his future. In the 80's and 90's he made his name as a pioneer of surfing at the Waimea Bay shorebreak. Clark had a unique talent for taking off on hopeless closeout shorebreak waves and surviving in one piece.

In 2007, Clark discovered his ability and passion to capture the extraordinary beauty of the shorebreak when his wife asked him for a picture of the ocean to decorate a bedroom wall. With the confidence of an experienced surfer, Clark jumped in the ocean, and started snapping away, recording the beauty and power of Hawaiian waves. "Clark's view" is a unique and often dangerous perspective of waves from the inside out, captured in photos for all to enjoy from the safety of dry land.

In just four years, Clark has gained national and international recognition for his North Shore shorebreak wave photography with appearances on television shows *Good Morning America, Inside Edition, The Today Show,* and *ABC World News Now.* Clark's work has been featured in publications worldwide including *National Geographic, Nikon World, Sierra Magazine, Paris Match, La Vie, Nature's Best Photography, Rangefinder, Geo, Surfer's Journal,* among others.

Achievements in 2011 include receiving the **2010 Oceans Photography Award** by Windland Smith Rice International Awards. Two of Clark's award winning images are on display at the Smithsonian National Museum of Natural History in Washington DC, through September 2011.

Clark resides with his wife and daughter on the island of Oahu. Additional information regarding Clark Little is available at www.clarklittlephotography.com

2011 Guests

Bret Abshire	Member Candidate
Michael Alexander	Member Candidate
Donald Blaskiewicz	Ken Ott
Kenneth Blumenfield	Member Candidate
Terry Burns	Resident Award, Basic Science
Bob Carter	Member Candidate
Richard Chua	Member Candidate
William Couldwell	Member Candidate
Farrokh Farrokhi	Charles Nussbaum
Mark Hamilton	Member Candidate
Jaimie Henderson	Member Candidate
Theodore Hole	Moustapha Abou-Samra
Christopher Honey	Member Candidate
John A. Jane, Sr.	Society - Cloward Award
Marco Lee	Member Candidate
Jason Lifshutz	Member Candidate
Andrew Little	Tim Harrington
Clark Little	Society - Special Lecture
Francisco Li	David Newell
William Loudon	Member Candidate
Michael Morone	Member Candidate
Isaac O'Dell	Society
Patrick Rhoten	Member Candidate
Ian Ross	Member Candidate
Venkatraman Sadanand	Member Candidate
Volker Sonntag	Society - Ablin Lecture
Patrick Wade	Moustapha Abou-Samra
David Westra	Moustapha Abou-Samra
Gabriel Zada	Resident Award, Clinical Science

Kauai is the shape of an almost perfect circle.

CONTINUING MEDICAL EDUCATION ACCREDITATION

This Activity has been planned and implemented in accordance with the Essential Areas and policies of the Accreditation Council for Continuing Medical Education through the joint sponsorship of the AANS and the Western Neurosurgical Society. The AANS is accredited by the ACCME to provide continuing medical education for physicians.

The AANS designates this live activity a maximum of 13.0 *AMA PRA Category 1™ Credits*. Physicians should claim only the credit commensurate with the extent of their participation in the activity.

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The material presented at the 2011 Western Neurosurgical Society Annual Meeting has been made available by the Western Neurosurgical Society and the AANS for educational purposes only. The material is not intended to represent the only, nor necessarily the best, method or procedure appropriate for the medical situations discussed, but rather it is intended to present an approach, view, statement, or opinion of the faculty, which may be helpful to others who face similar situations.

Neither the content (whether written or oral) of any course, seminar or other presentation in the program, nor the use of a specific product in conjunction therewith, nor the exhibition of any materials by any parties coincident with the program, should be construed as indicating endorsement or approval of the views presented, the products used, or the materials exhibited by the Western Neurosurgical Society and jointly sponsored by the AANS, or its Committees, Commissions, or Affiliates.

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The AANS controls the content and production of this CME activity and attempts to ensure the presentation of balanced, objective information. In accordance with the Standards for Commercial Support established by the Accreditation Council for Continuing Medical Education (ACCME), speakers, paper presenters/authors and staff (and the significant others of those mentioned) are asked to disclose any relationship they or their co-authors have with commercial interests which may be related to the content of their lecture. The ACCME defines "relevant financial relationships" as financial relationships in any amount occurring within the past 12 months that create a conflict of interest.

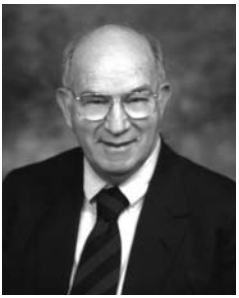
Speakers, paper presenters/authors and staff (and the significant others of those mentioned) who have disclosed a relationship* with comm:ercial interests whose products may have a relevance to their presentation are listed below.

Name	Disclosure	Type of relationship
John Adler	Varian Medical Systems	Stockholder/Employee
	Stanford University	Grants/Employee
Bob Carter	Exosome Diagnostics	Consultant
Richard Chua	Medtronic Sofamor Danek	Consultant
Mark Hamilton	Codman Canada	Grants/Research Support
Jaimie Henderson	Intelect Medical, Nevro Corp.	Stockholder
	Medtronic	Honorarium/Other Support
Christopher Honey	Medtronic	Grants/Honorarium
	St. Jude's	Grants
John A Jane, Sr.	Diffusion Pharmaceuticals	Financial/Material Support
J. Patrick Johnson	Pioneer Medical, SpineWave, Alphatec	Consultant/Stockholder
	Flexuspine	Stockholder
G. Michael Lemole	Brainlab	Consultant
	Lanx	Stockholder
	AANS, Varian	Honorarium
Michael McDermott	NIH	Grants/Research Support
Michael Morone	Medtronic	Stockholder
Thomas Scully	Lifespine	Stockholder/Consultant
	Lanx	Stockholder
	Ortho Development	Consultant
	Brainlab	Honorarium
Volker Sonntag	Medtronic	Other
Richard Wohns	NOC2	Stockholder
	Thompson Nuvasive, LDR, Orthofix	Consultant
	Rainier Technology	Advisory Board member

Relationship refers to receipt of royalties, consultantship, funding by research grant, receiving honoraria for educational services elsewhere, or any other relationship to a commercial interest that provides sufficient reason for disclosure.

Speakers, paper presenters/authors and staff (and the significant others of those mentioned) who have reported they do not have any relationships with commercial interests:

Michael Alexander
Venkatraman Sadanand
Terry Burns
William Couldwell
Austin Colohan
Donald Prolo
Michael Edwards
Javed Siddiqi
Steven Giannotta
Kenneth Blumenfeld
Charles Nussbaum
R.L. Patrick Rhoten
John Zhang
Andrew Little
John Bonner
William Loudon
David Newell
Gary Steinberg
Marc Vanefsky
Gabriel Zada
Jason Lifshutz
Moustapha Abou-Samra
Peter Gruen
Randy Smith
Marco Lee
Bret Abshire
Mark Linskey
Ian Ross



Dr. George Ablin
1923-1999

In 2000, the members of the Western Neurosurgical Society inaugurated a new lectureship designed to honor, in a tangible and enduring manner, one of the Society's most outstanding members. In its long history, the Society has had no more devoted contributor than Dr. George Ablin. He brought to the group stunning ability and experience, especially in matters of local, national, and international organization, in which he had few peers. He contributed through service in many areas including a memorable term as President. He was a wise and thoughtful counselor whose advice concerning many professional and personal questions always included a careful analysis, given with words of encouragement. There was no more active and engaged participant in all of the Society's affairs.

George Ablin was raised in Chicago, received his BS and MD from the University of Michigan, interned at Charity Hospital, New Orleans, Louisiana, did his residency at the University of Wisconsin, later was Instructor at the University of Michigan, and also became a Clinical Professor at California State University, Bakersfield. Dr Ablin was Board Certified in Neurological Surgery, a Fellow of the American College of Surgeons, and a Diplomat of the National Board of Medical Examiners.

Dr Ablin began practice in neurosurgery in Bakersfield, California, in 1953, was President of the Kern County Medical Society in 1984, and was very active in the California Medical Association in various leadership positions. He was Treasurer of the California Medical Review Board and received Distinguished Service awards from the Congress of Neurological Surgeons and the American Association of Neurological Surgeons. He was named Honorary President of the World Neurological Society and in 1989 he was selected as the Kern County Physician of the Year. George was the devoted father of seven children, three of whom became physicians.

George combined an exceptionally perceptive understanding of others, including hundreds of fellow neurosurgeons, with warmth and gentleness and lively humor. He loved his colleagues and friends, and he loved this Society. With this permanent lectureship, the members of the Western Neurosurgical Society honor George Ablin and his cherished wife, Millie.

2011 Ablin Lecturer

Volker Sonntag, MD

Vice Chairman, Division of Neurological Surgery
Barrow Neurological Institute

Born in West Prussia, Volker Sonntag, MD, spent his toddler years in a West German refugee camp. He came to America in 1957 not knowing a word of English. He learned to speak English by watching television. Dr. Sonntag worked his way through medical school and was in the first class to graduate from the University of Arizona Medical School in 1971.

For the past 30 years, Dr. Sonntag has performed surgery on thousands of patients and made significant contributions to the understanding of spinal disorders. He has co-edited five major books, made more than 800 presentations around the world, and written more than 90 textbook chapters and 460 papers. He is consistently recognized as one of the Best Doctors in America. In 2002, Dr. Sonntag was named the Honored Guest of the Congress of Neurological Surgeons, the highest honor paid to a neurosurgeon by his peers.

His colleagues and friends are very proud of what Dr. Sonntag brings to the group. According to Dr. Robert Spetzler, Chairman of BNA, "He always gives his best to his patients, his residents, fellows and his family. There is not a single false fiber in his body."

When not at work, Dr. Sonntag can be found spending time with his family or hiking the Grand Canyon, rim to rim. He would like to be remembered as "somebody who attempts to strike the perfect balance, with passion for work (especially research and the residency program), passion for family and passion for life."

Dr. Sonntag retired in January 2010, from practicing neurosurgery but remains at the Barrow Neurological Institute as Vice Chairman. The Barrow Neurological Institute is constructing the Sonntag Education Pavilion to honor Dr. Sonntag's contributions to neurosurgery and especially spinal neurosurgery. The educational pavilion will be state-of-the-art with electronic audio and video equipment to accommodate lectures, live surgery demonstrations, and educational conferences.

Ablin Lectures

2000 Arthur L. Day, MD, Professor of Neurosurgery, University of Florida
"Unruptured Intracranial Aneurysms and Sports Medicine in Neurosurgery"

2002 Tom Campbell, JD, PhD, Professor of Law, Stanford University
Former Congressman
"Is Freedom Possible in Medicine"

2003 Frederic H. Chaffee, PhD, Director, WM Keck Observatory, Hawaii
"The WM Keck Observatory at the Dawn of the New Millennium"

2004 Gerald Kooyman, PhD, Research Professor, Scripps Institute of Oceanography, San Diego
"Emperor Penguins: Life at the Limits"

2005 Lt. Col. Rocco Armonda, MD, Neurological Surgeon, U.S. Army
Bethesda, Maryland
"The Modern Management of Combat Neurotrauma Injuries: Battlefield to the Medical Center"

2006 August Turak, Spiritual and Business Consultant
"Spirituality and the Neurosurgeon"

2007 Donald Trunkey, MD, Internationally Renowned Trauma Surgeon
"The Crisis in Surgery with Particular Emphasis on Trauma"

2008 Michael Bliss, PhD, Emeritus Professor, University of Toronto
"Working Too Hard and Achieving Too Much? The Cost of Being Harvey Cushing"

2009 Michael A. DeGeorgia, MD, Professor of Neurology
Case Western Reserve University, Cleveland, Ohio
"Struck Down: The Collision of Stroke and World History"

2010 Chris Wood, PhD, Vice President for Administration, Santa Fe Institute
"What Kind of Computer Is The Brain?"

Ralph B. Cloward
1908-2000

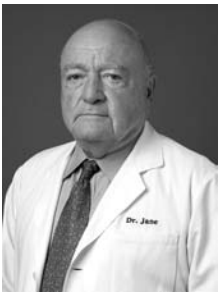
In 2002, the Western Neurosurgical Society established a Medal and Lecture to honor one of its most innovative and pioneering members, Ralph Bingham Cloward. With the gracious support of the Cloward family, this award honors both Ralph and his devoted wife, Florence.

Ralph Cloward was born in Salt Lake City, Utah, in 1908. He completed his undergraduate studies at the Universities of Hawaii and Utah and his medical education at the University of Utah and then at Rush Medical School in Chicago. He interned at St Luke's Hospital, Chicago, and then trained to become a neurosurgeon under Professor Percival Bailey, at the University of Chicago. He began his practice of neurology and neurosurgery in the Territory of Hawaii in 1938.

His academic accomplishments include visiting professorships at the University of Chicago, University of Oregon, University of Southern California, and Rush Medical School. He was Professor of Neurosurgery at the John A Burns School of Medicine at the University of Hawaii. He is the author of numerous papers and book chapters and has lectured and operated all over the world.

Dr Cloward's pioneering contributions encompass many areas of neurosurgery, but his enduring interest was the spine, where he devised three major operations. He first performed the posterior lumbar interbody fusion in 1943, reporting it in the Hawaiian Territorial Medical Association in 1945 and publishing it in the Journal of Neurosurgery in 1953. His unique approach for treating hyperhydrosis was reported in 1957. Independently, he conceived an anterior approach to the cervical spine, devised instruments for its implementation, and published his classic paper in the Journal of Neurosurgery on anterior cervical discectomy and fusion in 1958. He designed over 100 surgical instruments which continue to be used today by practicing neurosurgeons.

Throughout his career he educated the international community of neurosurgeons in the performance of the operations he devised. He contributed his time generously to patients who have been healed by his operations in the US and throughout the world. Hundreds of thousands of patients have benefited both directly and indirectly from his technical genius, insight, and enthusiasm as a teacher. Ralph loved the Western Neurosurgical Society and it's fitting that the WNS can now honor him with this Medal.



2011 Cloward Award Lecturer

John A Jane, Sr., MD, PhD

Professor of Neurosurgery, University of Virginia Health System

John Anthony Jane was born in September 1931 in Chicago, Illinois. He graduated from the University of Chicago with a BA, cum laude in 1951. He then attended the University of Chicago School of Medicine, receiving his Doctor of Medicine in 1956. He did his internship at the Royal Victoria Hospital at McGill University and returned to begin his Neurosurgical residency at the University of Chicago clinics in 1957 with Dr. Sean Mullan. In 1958 he was a Fellow in Neurophysiology at Montreal Neurological Institute with Dr. Herbert Jasper.

In 1959 he was a Senior Fellow in Neuropathology and in 1960 a Demonstrator in Neuropathology, both at McGill University in Montreal. In 1961 he was a Research Assistant in Neurosurgery to Sir Wylie McKissock at Atkinson Morley Hospital in London, England. In 1962, he was a Research Associate with the Department of Psychology at Duke University with Irving T. Diamond who was his PhD advisor. He then completed his Neurosurgical residency in 1963-1964 at the University of Illinois Research and Educational Hospital and the Illinois Neuropsychiatric Institute with Oscar Sugar and Eric Oldberg. The year 1965 found Dr. Jane as Senior Instructor in Neurosurgery at Case Western Reserve University. In 1967, Dr. Jane completed and was awarded a PhD from the University of Chicago, Division of Biological Sciences, Section of Biopsychology. After 4 years at Case Western Reserve, Dr. Jane assumed in 1969, the position of Professor and Chairman of the Department of Neurosurgery, University of Virginia School of Medicine in Charlottesville, Virginia. As of July 1, 2006, Dr. Jane stepped down as Chairman but remains on as Program Director.

While at Case Western Reserve with Frank Nulsen, he was involved in the training of Donald Becker, Harold Young, and Martin Weiss and subsequently, at the University of Virginia, in the training of 17 Professors, 11 of whom became Chairmen, 6 Associate Professors, and 8 Assistant Professors. Dr. Jane became a member of the Editorial Board of the Journal of Neurosurgery in 1984. He became the Chairman of the Editorial Board in 1990, the Associate Editor in 1991 and in 1992, he was elected Editor. He is also Editor and founder of Journal of Neurosurgery:Spine and Journal of Neurosurgery:Pediatrics.

He is married to Noella Fortier of Montreal, Quebec, Canada. The Janes' have four grown children (3 daughters and 1 son), six grandsons and two granddaughters.

CLOWARD AWARD

2003 George Ojemann, MD, Professor of Neurosurgery
University of Washington
"Investigating Human Cognition during Epilepsy Surgery"

2005 Donald Prolo, MD, Clinical Professor of Neurosurgery
Stanford University
"Legacy Giants in the Treatment of Spinal Disorders: Ralph Cloward and Marshall Urist"

2006 Martin Weiss, MD, Professor of Neurosurgery
University of Southern California
"A Historical Walk through Pituitary Surgery"

2007 Charles Wilson, MD, Past Chairman, Department of Neurosurgery
University of California, San Francisco
"The Future of Neuroscience

2008 Peter Jannetta, MD, Past Professor and Chairman
Department of Neurosurgery, University of Pittsburgh
"Vascular Compression in the Brainstem: Main Streaming Neurosurgery"

2009 L. Nelson Hopkins, MD, Professor and Chairman of Neurosurgery
University at Buffalo, State University of New York
"Neurosurgeons and Stroke: From Prevention to Treatment"

2010 Sean Mullan, MD, Professor Emeritus of Neurosurgery
University of Chicago
"Some Neurosurgical Fossils"

In ancient times, Kauai was known as Kaua'imanokalanipo, which translates to "*the fountainhead of many waters from on high and bubbling below*," Understandably, it was eventually shortened to its present form.

SCIENTIFIC PROGRAM

Sunday, September 11, 2011
Day 1, Session I
Moderators: Charles Nussbaum, Tom Scully

7:00–7:05		***Welcome***, **Austin Colohan,** WNS President 2011 Moment of Silence for the victims of September 11, 2001
7:05–7:20	1	"***The Comprehensive Adult Hydrocephalus Clinic: A Paradigm Shift for Management of Adult Hydrocephalus"*** Mark G. Hamilton, Calgary, Alberta (Member Candidate)
7:20–7:25		Discussion
7:25–7:40	2	***"Minimally Invasive Resection of Spinal Neoplasms"*** Rick V. Chua, Tucson, AZ (Member Candidate)
7:40–7:45		Discussion
7:45–8:00	3	***"Long Term Outcomes in Skull Base Carotid Stent Grafting: A Series of 38 Cases"*** Michael Alexander, Los Angeles, CA (Member Candidate)
8:00–8:05		Discussion
8:05–8:20	4	***"The Human Hyperdirect Pathway: Diffusion Tensor Imaging Tractography with Physiologic Confirmation in Parkinson's Disease Patients Undergoing Deep Brain Stimulation"*** Jaimie Henderson, Stanford, CA (Member Candidate)
8:20–8:25		Discussion
8:25–8:40	5	***"Proposed Modification of Smith Peterson Osteotomy"*** Bret Abshire, Temecula, CA (Member Candidate)
8:40–8:45		Discussion
8:45–9:00	6	***"The Role of Stereotactic Radiosurgery in the Treatment of Brain and Spine Metastases"*** Marco Lee, Stanford, CA (Member Candidate)
9:00–9:05		Discussion
9:05–9:20	7	***"Professional Boxing and Mixed Martial Arts in California"*** Kenneth Blumenfeld, San Jose, CA (Member Candidate)
9:20–9:25		Discussion
9:25–9:40	8	***"Transnasal Excerebration Surgery in Ancient Egypt"*** William Couldwell, Salt Lake City, UT (Member Candidate)
9:40–9:45		Discussion

SCIENTIFIC PROGRAM

Sunday, September 11, 2011
Day 1, Session I continued

9:45–10:00	9	***"An In Vivo Determination of the Accuracy of Diffusion Tensor Imaging (DTI) Tractography"*** Christopher Honey, Vancouver, BC (Member Candidate)
10:00–10:05		Discussion
10:05–10:35		**Break - Visit Exhibits**

Day 1, Session II
Moderators: Peter Gruen, Richard Wohns

10:35–10:50	10	***"Complex Hydrocephalus: Management of the Clinically Challenging Trapped Fourth Ventricle"*** William Loudon, Orange, CA (Member Candidate)
10:50–10:55		Discussion
10:55–11:10	11	***"Multiple Epileptic Foci"*** Venkatraman Sadanand, Loma Linda, CA (Member Candidate)
11:10–11:15		Discussion
11:15–11:30	12	***"Fixation Strategies of the Aging Spine"*** Patrick Rhoten, Beverly Hills, CA (Member Candidate)
11:30–11:35		Discussion
11:35–11:50	13	***"Brain Activity During Memory and Face Recognition Tasks in Humans"*** Ian Ross, Pasadena, CA (Member Candidate)
11:50–11:55		Discussion
11:55–12:10	14	***"The Use of Iliac Screws in Thoracolumbar Surgery: A Series of 23 Patients"*** Michael Morone, Billings, MT (Member Candidate)
12:10–12:15		Discussion
12:15–12:30	15	***"Neurosurgical Treatment of Coccidioidomycosis: 20 Year Retrospective Study at Santa Clara Valley Medical Center"*** Jason Lifshutz, Stanford, CA (Member Candidate)
12:30–12:35		Discussion

SCIENTIFIC PROGRAM

Monday, September 12, 2011
Day 2, Session III
Moderators: David Newell, Moustapha Abou-Samra

8:00–8:15	16	***"Diffusion Tensor Imaging as an Adjunct to Resection of Brain Stem and Spinal Cord Tumors in Children"*** Michael Edwards, Stanford, CA (Member)
8:15–8:20		Discussion
8:20–8:35	17	**Resident Award – Basic Science** ***"Germ Cell Tumors After Transplantation of Adult Bone Marrow Stem Cells into the Ischemic Brain"*** Terry Burns, Stanford University
8:35–8:40		Discussion
8:40–8:55	18	**Resident Award – Clinical Science** ***"Gamma Knife Radiosurgery for Benign Cavernous Sinus Tumors: Clinical and Imaging Outcomes with Long-Term Follow-Up"*** Gabriel Zada, University of Southern California
8:55–9:00		Discussion
9:00–9:15	19	***"Serum Based RNA Biomarkers in Human Glioma"*** Bob Carter, San Diego, CA (Member Candidate)
9:15–9:20		Discussion
9:20–9:40	20	**Historical Lecture** ***"Regional Neurosurgical Societies: Past, Present and Future"*** Randall Smith, WNS Historian
9:40–10:10		**Break - Visit Exhibits**

SCIENTIFIC PROGRAM

Monday, September 12, 2011
Day 2, Session IV
Moderators: Austin Colohan, John Bonner

10:10–10:15	Introduction of Ablin Lecturer, Austin Colohan
10:15–10:45	**Ablin Lecture**
	"Cervical Instrumentation: Past, Present & Future" Volker Sonntag
10:45–10:50	Introduction of Clark Little, Austin Colohan
10:50–11:20	**Special Lecture**
	"Shorebreak Art of Clark Little" Clark Little
11:20–11:25	Introduction of Cloward Award Winner, Austin Colohan
11:25–11:55	**Cloward Lecture**
	"Anterior vs Posterior Approaches to the Cervical Spine" John A Jane, Sr.
11:55–12:00	Introduction of WNS President, Randy Smith
12:00–12:30	**Presidential Address**
	"A Path Less Taken: Lunacy or Illumination?" Austin Colohan

Kauai is 552 square miles large and is the oldest of the major Hawaiian Islands.

SCIENTIFIC PROGRAM

Tuesday, September 13, 2011
Day 3, Session V

Moderators: Randy Smith, Tom Scully

7:00–7:15	21	***"Moyamoya Disease: The Stanford Experience 1991-2011. What Have we Learned?"*** Gary Steinberg, Stanford, CA (Member)
7:15–7:20		Discussion
7:20–7:35	22	***"Results of Lumbar-Peritoneal Shunts for the Treatment of Normal Pressure Hydrocephalus"*** Michael McDermott, San Francisco, CA (Member)
7:35–7:40		Discussion
7:40–7:55	23	***"Red Desaturation Testing: A Simple Bedside Method for Detecting Chiasmopathy in Patients with Pituitary Adenomas Compressing the Optic Chiasm"*** Andrew Little, Phoenix, AZ (Guest)
7:55–8:00		Discussion
8:00–8:30		***"Radiosurgery Update:*** John Adler, Stanford, CA (Member)
8:30–8:35		Discussion
8:35–9:05		***"Patient Safety in the Neuro ICU"*** Marc Vanefsky, Anaheim, CA (Member)
9:05–9:10		Discussion
9:10–9:25	24	***"Harnessing Surgical Brain Injury: Neurosurgeons Taking the Battle Home"*** John Zhang, Loma Linda, CA (Honorary Member)
9:25–9:30		Discussion
9:30–10:00		**Break - Visit Exhibits**

SCIENTIFIC PROGRAM

Tuesday, September 13, 2011
Day 3 , Session VI

Moderators: Austin Colohan, Charles Nussbaum

10:00–10:15 25 ***"Efficacy and Evolution of the Socioeconomic Fellowship of the Council of State Neurosurgical Societies"***
Mark Linskey, Irvine, CA (Member)
10:15–10:20 Discussion

10:20–10:50 **Special Lecture**

"Living in the Limelight: A Neurosurgeon's Perspective on the Tucson Tragedy"
Michael Lemole, Tucson, AZ (Member)
10:50–10:55 Discussion

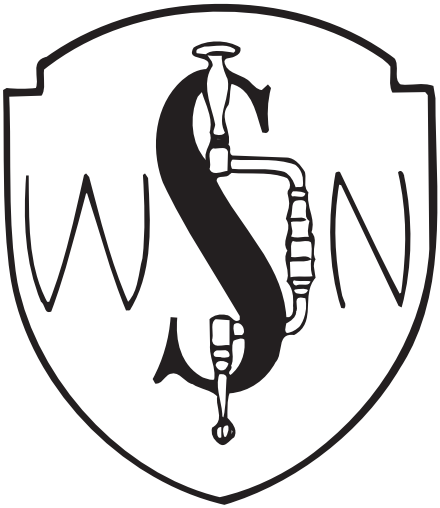
10:55–11:10 26 ***"Cystic Vestibular Schwannomas"***
Steve Giannotta, Los Angeles, CA (Member)
11:10–11:15 Discussion

11:15–11:30 27 ***"Computerized Image Guided Spine Surgery: The State-of-the-Art"***
Patrick Johnson, Los Angeles, CA (Member)
11:30–11:35 Discussion

11:35–11:50 28 ***"Paradoxical Apostasy from Effective and Safe Ethylene Oxide Sterilization of Human Bone Allografts: A 30-year Experience"***
Don Prolo, San Jose, CA (Member)
11:50–12:00 Discussion

12:00 Meeting Adjourn

58th Annual Meeting to be held September 7-10, 2012
Broadmoor Hotel, Colorado Springs, Colorado



Abstracts

There are only 12 letters in the Hawaiian alphabet
Vowels - A, E, I, O, U Consonants - H, K, L, M, N, P, W

1. ***"The Comprehensive Adult Hydrocephalus Clinic: A Paradigm Shift for Management of Adult Hydrocephalus"***
Mark G Hamilton, MD, University of Calgary- Calgary, Alberta

Introduction: Adult hydrocephalus patients are often assessed and cared for by individual physicians in an unstructured and unfocused clinic environment or in a clinic with a limited focus (e.g. idiopathic Normal Pressure Hydrocephalus (iNPH)).

Methods: In 2001, a Pediatric Neurosurgeon, with the goal to standardize and enhance the care for adult patients with hydrocephalus, established the University of Calgary Adult Hydrocephalus Clinic (AHC). Investigative and management protocols were established and a patient database was initiated.

Results: As of December 2010, there were approximately 450 patients being followed in the Adult Hydrocephalus Clinic. An additional 750 patients with treated hydrocephalus have also been identified and registered. This population includes patients with a diagnosis of hydrocephalus as a child (transitional patients), adults with acquired hydrocephalus (e.g. trauma, hemorrhage), patients with previously untreated congenital hydrocephalus, and patients with iNPH. Treatment modalities have included shunting and endoscopic third ventriculostomy (ETV). Approximately 8% of the AHC patients have had no treatment for their hydrocephalus and are being monitored with clinical, MRI, and neuropsychological evaluations. Approximately 95% of patient concerns related to their hydrocephalus are investigated in the outpatient setting, thus avoiding Emergency Room utilization.

Conclusion: Our comprehensive Adult Hydrocephalus clinic model represents an important evolution in the care of these patients. It provides us with an efficient assessment and treatment environment and also with an opportunity to better understand the natural history of patients with treated and untreated hydrocephalus.

2. ***"Minimally Invasive Resection of Intraspinal Neoplasms"***
Richard V Chua, MD, Northwest Neurospecialists-Tucson, AZ

Introduction: Minimally invasive techniques in spine surgery are becoming increasingly more popular due to their reduction in approach-relate complications, length of stay, and improvement in clinical outcomes compared to traditional open techniques. There are few reports of these techniques applied to intraspinal neoplasms.

Methods: A retrospective review of six patients who underwent minimally invasive resection of intraspinal neoplasms over a 14-month period by a single surgeon was performed. Clinical data, preoperative and postoperative imaging, operative and pathology reports, were reviewed. A paramedian, muscle-splitting unilateral approach, using fixed and expandable tubular retractors, microscopic dissection, and dural closure techniques will be discussed. Special emphasis on dural retraction and dural closure techniques will be highlighted.

Results: Six patients (3 men, 3 women), ranging in age from 63 to 73 years, underwent minimally invasive resection of intraspinal tumors with a follow-up period of 2 to 15 months. Tumors occurred in the cervical (1), thoracic (3), lumbar (1), and sacral (1) regions. All but one tumor were intradural. Pathologies included schwannoma, meningioma, metastatic prostate cancer, and metastatic small cell lung cancer. Lengths of stay ranged from 2 hours (outpatient) to 3 days. All patients remained neurologically stable or improved prior to discharge and at last follow-up. There were no approach-related complications related to the minimally invasive technique.

Conclusions: As demonstrated in this series of six retrospectively reviewed cases, minimally invasive techniques can be safely and effectively applied in the resection of intraspinal neoplasms, including intradural pathologies. Patients undergoing these procedures appear to derive the same benefits as patients who undergo minimally invasive techniques for decompression, fusion, and internal fixation. These include reduction in approach-related complications, length of stay, and improved clinical outcomes.

3. ***"Long Term Outcomes in Skull Base Carotid Stent Grafting: A Series of 38 Cases"***

Michael J Alexander, MD, Armen Choulakian,MD,
Abhineet Chowdhary, MD, Cedars-Sinai- Los Angeles, CA

Introduction: Injury to the internal carotid artery at the skull base may be difficult to manage as it often requires emergent treatment, due to the potential for life-threatening hemorrhage. Since this segment of the artery is difficult to access surgically, endovascular treatment by either parent artery occlusion or endoluminal reconstruction is frequently necessary.

Methods: This is a prospective case series of 38 patients who had skull base carotid injury or spontaneous hemorrhage who had placement of one or more stent grafts for treatment. Patients were loaded with either 300mg or 600mg of clopidogrel and 325mg of aspirin either a few hours prior to the endovascular procedure or via an oral gastric tube at the time of the procedure. Patients also received intraprocedural intravenous heparin. Follow-up imaging was performed at 6 months post intervention and patients were then followed up clinically on an annual basis.

Results: Of the 38 patients who had treatment, 16 patients had a traumatic direct carotid cavernous fistula, 10 patients had iatrogenic injury to the ICA from surgery, and 9 patients had epistaxis or pseudoaneurysm from a gunshot, knife wound, or other trauma. Three patients had prior malignant skull base tumor resection with subsequent radiation therapy that developed acute epistaxis in a delayed manner. Two patients developed thromboembolic events within the first 30 days of treatment. With an average imaging follow up of 2.7 years, two patients had asymptomatic occlusion of their stent grafts, 30 patients had patent stent grafts, and six patients had no imaging follow-up.

Conclusion: Stent grafts provide a safe alternative to deliberate parent artery occlusion in patients with spontaneous hemorrhage or trauma to the ICA. With aggressive anti-platelet therapy a long term symptomatic thromboembolic rate of 5.2 % was seen.

Hawaii is the only U.S. state that grows coffee. The largest coffee plantation, *"Kauai Coffee Company,"* is on the Island of Kauai.

4. ***"The Human Hyperdirect Pathway: Diffusion Tensor Imaging Tractography with Physiological Confirmation in Parkinson's Disease Patients Undergoing Deep Brain Stimulation"***
Jaimie M Henderson, MD, Diane Whitmer, Bruce Hill, Scott Atlas, Volker Coener, Burkhard Madler, and Helen Bronte-Stewart,
Stanford University-Stanford, CA

Introduction: The 'hyperdirect' pathway is a recently-described direct projection from primary and supplementary motor cortex to the subthalamic nucleus (STN). Recent animal studies have shown that modulation of this pathway plays a prominent role in the mechanism of action of deep brain stimulation (DBS) of the STN. We investigated the ability to precisely target this pathway in patients undergoing DBS for Parkinson's disease (PD).

Methods: In 12 PD patients undergoing DBS, diffusion tensor imaging (DTI) was performed using a custom protocol. Deterministic fiber tracking was performed starting with a trapezoidal region of interest (ROI) adjusted to fit the STN as identified by typical signal characteristics on T2 CUBE imaging.

In four subjects, physiological confirmation of connectivity between cortex and STN was tested. A strip electrode was placed subdurally over the origin of the hyperdirect pathway using electromagnetic navigation. Simultaneous recordings were made from the DBS electrode and the cortical strip. Coherence between STN and cortex was measured using a suite of analysis tools.

Prior to DBS placement, stimulation was delivered through the cortical strip electrode while patients performed a repetitive pronation-supination task. Angular velocity was measured both before and during stimulation using accelerometers mounted on the hand. Rigidity was rated before and during stimulation using the 0-4 Unified Parkinson's Disease Rating Scale.

Results: Simultaneous recordings from cortex and STN showed coherence between these two areas which was maximal at the contacts directly overlying the DTI-defined origin of the hyperdirect pathway. Improvements in bradykinesia and rigidity were seen in 3 out of 4 patients during high-frequency stimulation.

Conclusions: The human hyperdirect pathway can be successfully visualized and targeted using DTI tractography. Coherence between STN and cortex establishes the physiological connectivity of this pathway, and stimulation at the cortical target at least partially ameliorates the symptoms of Parkinson's disease.

5. ***"Proposed modification of Smith Peterson Osteotomy"***
Bret Abshire, MD, Temecula, CA

This talk will cover a proposed modification of the Smith Peterson osteotomy for increasing lordosis. This modified osteotomy can create significant improvements in lordosis and be used as a substitute for pedicle subtraction osteotomy.

6. ***"The Role of Stereotactic Radiosurgery in the Treatment of Brain and Spine Metastases"***
Marco Lee, MD, Stanford University-Stanford, CA

There is growing evidence to support the superiority of radiosurgery in the treatment of metastatic brain and spine disease over traditional radiotherapy. This has an important impact on the role of the neurosurgeon to participate in the post-operative and non-operative management of these lesions. We will review the effectiveness of stereotactic radiosurgery (SRS) in the management of brain and spine metastases as a primary and adjuvant therapy. Several controversial aspects of SRS in the treatment of brain metastases will be discussed, including the limitations of the number and size of lesions, and the role of SRS alone, or in combination with surgery, (or whole brain irradiation), in the management of metastases. With the advent of frameless SRS systems, such as the CyberKnife, growing evidence demonstrates the efficacy in pain relief and tumor control and also calls for a shift in treatment paradigms for spinal metastases.

1,467 patients with 1,791 brain metastases and 293 patients with 317 spinal metastases were treated at the Stanford University CyberKnife Center between 2000-2010. We present our experience and clinical outcomes using SRS in metastatic brain and spine disease, and discuss some of the major ongoing randomized trials in this area. Overall, local tumor control rate ranges between 80-100%, depending on tumor type and clinical situation, and symptomatic complications from radiation necrosis occurred in less than 5%. Advantages of SRS over external beam irradiation include avoiding irradiating the entire brain or spinal cord segment, much shorter treatment times, and cost-effectiveness.

This presentation will highlight the evidence-based advantages of SRS over traditional treatment modalities and hopefully encourage more surgeons to directly participate in the management of metastatic disease beyond surgery.

7. ***"Professional Boxing and Mixed Martial Arts in California"***
Kenneth Blumenfeld, MD, San Jose, CA

Many have commented on the ethical lapses of those that support or are entertained by pugilistic activities such as professional boxing and mixed martial arts (MMA). Nonetheless, these sports are thriving nationally and internationally. In California, it is the responsibility of the California Athletic Commission to regulate these sports, thereby assuring fairness and protecting the safety of its competitors. In a sport that rewards the ability to inflict TBI on the opponent, this is no small task. This talk examines some of the policies, practices, and evidence- based regulations that the Commission uses to accomplish these goals. While California makes an admirable attempt, and certainly a better one than some other states, it is lacking with respect to standardized approach, data collection, and adherence to emerging evidence-based recommendations. As MMA and boxing are enjoying a resurgence of popularity, the long term neurological well- being of the fighters remains unknown.

8. ***"Transnasal Excerebration Surgery in Ancient Egypt"***
William T Couldwell, MD, PhD, Andrew Fanous, MD,
University of Utah-Salt Lake City, UT

Ancient Egyptians were pioneers in many fields, including medicine and surgery. The transnasal approach to skull base and intracranial structures was first devised by Egyptian embalmers to excerebrate the cranial vault during mummification. In this historical vignette, we examine paleoradiologic and other evidence from ancient Egyptian skulls and mummies of all periods, from the Old Kingdom to Greco-Roman Egypt, to shed light on the development of transnasal surgery in this ancient civilization. We confirm earlier observations concerning the laterality of this technique, suggesting that ancient Egyptian excerebration techniques penetrated the skull base mostly on the left side. We also suggest that the original technique used to access the skull base in ancient Egypt was a transethmoidal one, which later evolved to follow a transsphenoidal route similar to the one used today to gain access to pituitary lesions.

9. ***"An In Vivo Determination of the Accuracy of MRI Diffusion Tensor Imaging (DTI) Tractography"***
Christopher R Honey, MD, Talia Vertinski, Alex MacKay,
University of British Columbia-Vancouver, BC

Introduction: Diffusion tensor imaging (DTI) tractography is a MRI technique that can predict the location and orientation of white matter tracts based on the preferential movement of water molecules within axons rather than across their membranes. DTI is used to map brain pathways (e.g. corticospinal tract) and understand functional circuits within the brain. No study has confirmed the accuracy of this technique for deep brain pathways. The current study attempts to measure the accuracy of this new technique in vivo.

Methods: This study was approved by the UBC clinical research ethics board. Twelve Parkinson's disease patients receiving elective deep brain stimulation (DBS) within the subthalamic nuclei (STN) were prospectively studied. All patients had a pre-operative 3T MRI with diffusion tensor imaging (DTI) to predict the location of their corticospinal tracts. During surgery, the actual location of each corticospinal tract was determined with intra-operative macrostimulation. The pre-operative DTI-predicted location and the intra-operative confirmed location of each corticospinal tract was then compared off line.

Results: The three dimensional location of the corticospinal tract as determined in vivo during macrostimulation was taken as the definitive location of this structure. The distance from this gold standard to the DTI predicted location was defined for twenty-four data points (12 patients bilaterally). The mean distance and standard deviation was 1.8 ± 0.5 mm.

Conclusion: DTI tractography is able to predict the location of the corticospinal tract as it passes through the basal ganglia to within 2 mm. This technique may become

another useful tool for neurosurgeons who operate within the basal ganglia.

10. ***"Complex Hydrocephalus: Management of the Clinically Challenging Trapped Fourth Ventricle"***
    William Loudon, MD, Children's Hospital of Orange County- Orange, CA

Almost sixty years after the development of shunts for CSF diversion, hydrocephalus remains a challenging clinical focus for neurosurgeons. This is even truer for patients who undergo diagnosis and require treatment for complex hydrocephalus. Children who develop a trapped fourth ventricle after the placement of a ventriculoperitoneal shunt can present challenging clinical issues associated with their complex hydrocephalus.

One such patient presented herein, a three year old male with history of premature delivery, who subsequently developed an intraventricular hemorrhage of prematurity with resultant hydrocephalus, exemplifies the potential challenges associated with intervention for a clinically significant, developing trapped fourth ventricle. This patient underwent endoscopic acqueductoplasties, fourth ventricular shunting and finally, suboccipital craniectomy with open fenestration of a fourth ventricular cyst. The clinical symptoms and diagnostic studies which supported these surgical interventions will be reviewed as well as presentation of other patients who have benefited from this strategy.

The Hawaiian Islands National Wildlife Refuge northwest of Kauai is the world's largest bird sanctuary.

11. ***"Resective Surgery for Multiple Epileptic Foci"***
Venkatraman Sadanand, MD, PhD, J-Z Tellez, R Griebel,
Loma Linda University- Loma Linda, CA

Background: Resective epilepsy surgery requires careful selection of patients. Meticulously selected patients have a good chance of seizure-free or reduced seizure outcomes. Selection of patients has centered around concordance of evidence and clear definition of unique location of seizure onset. Patients with multiple foci of seizures are often not considered resective surgical candidates. This paper presents two patients with multiple foci who have had successful resections.

Methods: One 44 year-old and one 27 year-old patient with long histories of intractable epilepsy were investigated. One of them had previous multiple surgeries at other institutions. The patients received resections in the temporal and frontal lobes. Both patients had epileptogenic foci in the same hemisphere. Surgery required multistage operations in both.

Results: One patient had a surgical complication of subdural hematoma from placement of grids and strips. Both patients have remained seizure-free for 3 years now. They are not on any antiepileptic drugs. Both patients are driving and have a gratifying personal life.

Conclusions: Intractable multifocal epilepsy that is amenable to surgical resection is rare. We have shown that carefully selected patients receiving tailored resections with multiple operations stand a chance for being seizure-free without medications.

12. ***"Fixation Strategies of the Aging Spine"***
R L Patrick Rhoten, MD, Cedars -Sinai Spine Center- Los Angeles, CA

Osteoporosis and spinal deformities are major health-care problems that are increasing with the aging population. Such patients are more prone to develop painful and debilitating spinal deformities that are difficult to treat. The surgical treatment options in aging patients are limited because of the tendency for instrument failure secondary to screw pullout and implant subsidence. The literature supports the use of vertebral augmentation in conjunction with pedicle screw-based instrumentation for treating more severe spinal deformities. Other techniques and modifications with evidence of reduced failure risk are bicortical screws, hydroxyapatite coatings, double screws, and expandable screws. Anterior approaches may provide another option for treatment.

Spinal deformities in older patients with osteoporosis are difficult to treat because of their debilitating and progressive nature. Unique surgical approaches and instruments have been designed to decrease construct failures in this patient population by reducing implant subsidence, screw pullout, and the incidence of revision surgery. The success of these techniques depends on meshing biomaterial, biologic, and biomechanical aspects with clinical considerations. Addition of these aspects in one's practice will potentially lead to improved treatment options for patients with osteoporosis who are

suffering from spinal abnormalities.

13. ***"Brain Activity During Memory and Face Recognition Tasks in Humans"***
Ian B Ross, MD, CA Heller, AM Mamelak, U Rutishauser , O Tudusciuc, R Adolphs-Pasadena, CA

Background: Do you really understand how the brain works? The insertion of depth electrodes for EEG monitoring provides a special opportunity for recording electrical activity directly from the brain, and unveiling the workings of the brain. Collaboration between a major research university and the Epilepsy and Brain Mapping Program at a community hospital led to an ability to record single neuron activity in some of the deep nuclei, including the amygdala and hippocampus. Recordings from epilepsy patients during defined psychological tasks has subsequently allowed for elucidation of certain aspects of brain function. Recent work has focused on memory function and face recognition.

Methods: Ten neurosurgical patients had orthogonally placed bilateral depth electrodes which included targets in the amygdalae and hippocampi. Eight 40μm microwires were inserted through each clinical electrode in these locations. Bipolar recordings from these microwires, using one of the eight as a reference, were made during a learning task (hippocampus) and during a facial expression recognition task (amygdala), along with local field potential recordings.

Results: Successful memory formation was predicted by a tight coordination of spike timing with the local theta oscillation in the hippocampus. More stereotyped spiking predicted better memory, as indicated by higher retrieval confidence reported by subjects. About half of the amygdalar neurons responded selectively to faces or parts of faces, and about 20% of all amygdalar neurons responded only to the whole face.

Conclusion: A link between the known modulation of theta oscillations by many memory-modulating behaviors and circuit mechanisms of plasticity is shown in the memory task. The amygdalar data suggests that this structure plays a predominant role in the processing of global information about faces rather than more selective processing of individual facial features. Collaboration between neuroscientists and clinicians provides outstanding opportunities for illuminating how the brain really works.

14. ***"The Use of Iliac Screws in Thoracolumbar Surgery - A Series of 23 Patients"***
Michael A Morone, MD, PhD, FABNS, Linda Himmelspach RN,
Eugen Dolan MD, FABNS, The Billings Clinic, Billings, MT

Objective: The addition of iliac screw fixation to lumbosacral spinal constructs increases the stiffness across the lumbosacral (L-S) junction which may lead to increased bony union after arthrodesis. Iliac screw fixation is commonly used in spinal surgery by orthopedic surgeons, while less commonly used by neurosurgeons. In this series of 23 patients, iliac screw fixation was used to stabilize the L-S junction after spinal arthrodesis. The method of selection of patients who may benefit from iliac screw fixation, the technique of iliac screw fixation, and the results of this series will be discussed.

Methods: Retrospectively, the authors examined and analyzed the patient files and images of 23 patients that were surgically treated with lumbar fusion / instrumentation supplemented with iliac screw fixation over a 5 year period (2007 to 2011). Iliac screws were placed fluoroscopically and with the use of a Pedigard^{R} to probe the iliac bone. Median patient age at surgery was 63 years. The average number of spinal levels instrumented was six.

Results: One year after spinal surgery, 20 of 23 patients demonstrated bony union across the L-S junction on CT scan. One patient had iliac screw malposition requiring inability to place a screw on one side. There were no other complications directly related to the use of iliac screw fixation in the perioperative period. Four patients underwent explantation of iliac screws after solid bony union was demonstrated on CT scan due to sacroiliac pain. Explantation of the iliac screw resulted in resolution of sacroiliac pain in these four patients. Three patients died in the observation period due to causes unrelated to their spinal surgery.

Conclusion: The use of iliac screws results in very high bony union rates across the L-S junction and also a low complication rate.

15. ***"Neurosurgical Treatment of Coccidioidomycosis: 20 year retrospective study at Santa Clara Valley Medical Center"***
Jason Lifshutz, MD, Stanley Shatsky, MD, Stanford University-Stanford, CA

Methods: Retrospective chart review of patients treated for Coccidioidomycosis on the neurosurgical service at Santa Clara Valley Medical Center

Summary: Coccidiodomycosis is caused by *C. immitis*, a fungus indigenous to the southwestern United States, Mexico, Central and South America. It is mainly a disease of healthy people, with effects usually limited to the lungs and respiratory system. Disseminated disease occurs in less than one percent of cases, with the central nervous system being an end target. Patient populations at risk for dissemination are those at the extremes of age, non-white populations, and the immunocompromised. CNS involvement is in the form of meningitis, meningioencephalitis, meningiomyelitis, with parenchyma destruction, and vasculitis, with associated infarcts.

Neurosurgical intervention is often required to treat the complications associated with the disease as well as with the treatment of the infection itself. We will present the experience of the neurosurgical service at Santa Clara Valley Medical Center, a referral center in the center of an endemic at risk population for this infection. We will present diagnostic and surgical strategies, including novel intrathecal injection methods (in case presentation format) in order to highlight the relapsing and morbid nature of this disease.

16. ***"Diffusion Tensor Imaging as an Adjunct to Resection of Brain Stem and Spinal Cords Tumors in Children"***
Michael S B Edwards, MD, Kristen Yoem, MD, Samantha J Holdsworth, PhD, Mural Askow, PhD, Division of Pediatric Neurosurgery,
Stanford University-Stanford, CA

Diffusion Tensor Imaging (DTI) is becoming a critical adjunct in the determination and planning for the resection of tumors in eloquent regions of the brain. Its application to tumors residing within the brain stem and spinal cord, although more complex, has allowed us to select appropriate candidates for resection and to determine the surgical approach corridor to minimize the risk of neurologic deficit in ten intrinsic focal brainstem and four intrinsic spinal cord tumors.

A specialized internally developed DTI technique (GRAPPA DTI) was used for all patients. Patient data were acquired using a 3T GE system with an 8-channel head coil and a twice-refocused GRAPPA DT-EPI sequence (acquisition matrix = 1282, acceleration factor = 3, NEX = 3, 25 isotropically distributed diffusion directions with b = 1000s/mm2, 5 T2-weighted images, slice thickness/gap = 3mm/0mm, FOV = 20cm). For each data set, fiber tractography was performed using custom-built software. Seed regions were placed on within the brainstem and spinal cord, including the tumor and surrounding tissue. Euler's method was used for tracking with fractional anisotropy (FA) threshold = 0.15 and curvature threshold = 40°.

This technique has allowed us to determine the position of ascending, descending and transverse fiber tracts surrounding tumor, allowing us to pick a safe approach corridor. Combined with direct stimulation of the floor of the 4th ventricle to map out cranial nerve and nuclei position and intraoperative SSEP, MEP, and BAER monitoring, aggressive resection of tumor was accomplished with only transient new neurologic dysfunction. DTI tractography demonstrated important motor and sensory function transgressing all diffuse intrinsic pontine gliomas (DIPG) deemed not amenable to resection and entrapped motor fibers contained within one pediatric spinal cord tumor (diffuse astrocytoma) as opposed to the complete absence of fiber tracts in the three low grade pilocytic tumors.

Representative cases will demonstrate how application of this technique enhances our selection process and ability to safely resect these difficult tumors.

17. ***"Serum Based RNA Biomarkers for Human Glioma"***

Bob Carter MD, PhD, F Hochberg, X Breakefield, S Kesari, S Kalkanis, J Skog, M Noerhelm, L Balaj, S Sivaramen, C Chen,
University of California at San Diego-San Diego, CA

Background: Microvesicles (including exosomes) are small lipid bilayer vesicles released from all cells into bodily fluids and have been shown to harbor both RNA and DNA from the parent cell from which they were released. Recently, a rapid method to extract high integrity RNA from serum microvesicles was developed allowing reliable assessment of their mRNA content. This allows us to gain a transcriptional profile of brain tumors without the need for invasive biopsy. Here we use serum microvesicles to examine the expression pattern of various genes in glioblastoma patients including specific mutations such as the EGFRvIII gene.

Methods: Serum samples under an approved IRB protocol were collected from patients with biopsy proven glioblastoma. Microvesicles were isolated using differential ultracentrifugation. During RNA extraction a DNase step was included to remove contaminating DNA. RNA integrity was assessed using the Agilent Bioanalyzer. Isolated RNA was used for Agilent microarray analysis and qPCR based EGFRvIII mutation detection.

Results: RNA with visible rRNA peaks was successfully isolated from all serum samples assessed. Microarray expression profiles of RNA isolated from serum microvesicles (exoRNA) from 8 glioblastoma (GBM) patients and 8 normal healthy controls clearly separated the two groups when used in unsupervised clustering. A distinct subset of both upregulated and downregulated genes in the glioma patients was revealed. This indicates distinct differences between the two groups and highlights the potential diagnostic relevance of RNA contained in serum microvesicles. In addition, in patients whose tumors were known to be EGFR amplified and EGFRvIII positive, we found a high rate of detection of EGFRvIII in serum microvesicle RNA (4/4) but not in controls (0/10), with 100-200 gene copies detected per ml.

Conclusions: These data indicated that microvesicle RNA can reveal glioma specific genetic changes in patient serum. This may have utility in detecting brain tumors via a serum assay or analyzing specific genetic changes in a glioblastoma patient without invasive brain biopsy.

Manatees "see" with 3,000 hairs on their bodies to help them maneuver in murky waters. Each hair is connected to 20-50 nerve fibers.

18. ***"Germ Cell Tumors after Transplantation of Adult Bone Marrow Stem Cells into the Ischemic Brain"***

Terry C Burns, MD, Dominic T Schomberg, Zhenhong Nan, Erin E Norby, Saswati Mahapatra, Kenneth W Dodd, Kelly A Sovell, Tim O'Brien, Walter C Low, Catherine M Verfaillie, Stanford University-Stanford, CA

Introduction: Adult bone marrow-derived stem cells have been shown to provide neuroprotective effects in animal models of ischemic brain injury. Multipotent Adult Progenitor Cells (MAPCs) are bone marrow-derived cells capable of differentiating into mature functional cell types from multiple germ layers in vitro and in vivo. To date, no tumor formation has been described after systemic or local tissue delivery of MAPCs.

Methods: We here evaluated the behavior of murine and rat bone marrow-derived multipotent adult progenitor cells (MAPCs) in a mouse model of permanent distal middle cerebral artery occlusion. Molecular, cell culture and histological techniques were employed to investigate the properties of the transplanted cells and the resulting grafts.

Results: After intracranial transplantation, GFP-labeled MAPCs exhibited en mass migration along the corpus callosum into the infarct site. At 2 weeks, the resulting graft occupied the full width of the cortex, completely replacing the infarct. The foot-fault assay suggested amelioration of sensorimotor deficits in MAPC-treated animals at 2 weeks. Thereafter, however, the MAPC graft continued to expand, yielding fatal embryonic yolk sac tumors. Expression of pluripotency markers including Oct4, was required for tumor formation. Gene array analysis of multiple lines of mouse and rat MAPCs revealed a primitive endodermal precursor expression profile consistent with hypoblast. Moreover, MAPCs contributed to yolk sac chimeras after aggregation with mouse morulas. The absence of pluripotency markers in early isolation, as well as decreased Oct-4 promotor methylation over time in culture indicated that MAPCs represent the product of in vitro de-differentiation via spontaneous epigenetic reprogramming.

Conclusions: Certain bone marrow-derived stem cells may pose previously unrecognized risks of germ cell tumor formation due to spontaneous in vitro de-differentiation. Pluripotency markers, including Oct 4, must be routinely assayed in cultures of adult stem cells destined for clinical use to minimize the risk of germ cell tumor formation.

19. ***"Gamma Knife Radiosurgery for Benign Cavernous Sinus Tumors: Clinical and Imaging Outcomes with Long-Term Follow-Up"***

Gabriel Zada, MD, Abriel Zada, MD, MH Pham, MD, L Davidson, MD, JS Kuo, MD, PhD, C Yu, PhD, PG Pagnini, MD, C Liu, MD, PhD, MH Weiss, MD, SL Giannotta, MD, MLJ Apuzzo, MD,
Departments of Neurosurgery and Radiation/Oncology, Keck School of Medicine, University of Southern California- Los Angeles, CA;
Department of Neurosurgery,
University of Wisconsin Medical School- Madison, WI

Object: In recent years, benign tumors of the cavernous sinus have been increasingly managed with Gamma Knife Radiosurgery (GKRS). We aimed to study the long-term tumor control rates, clinical outcomes, and incidence of toxicity in patients undergoing GKRS for benign lesions of the cavernous sinus.

Methods: Data was retrospectively reviewed for 126 patients that underwent GKRS for benign cavernous sinus tumors between the years 1994-2002. A minimum follow-up time of 5 years (range 60.3-180.2 months) was available for 95 patients (75%). The mean age was 54 years. The indications for GKRS were: pituitary adenoma in 47 patients (49%), meningioma in 43 patients (45%), schwannoma in 4 patients (4%), and hemangioma in 1 patient (1%). Seventy-nine patients (83%) underwent prior surgical resection. The median tumor volume was 3.4 cm^3 and the median dose to the 50% isodose line was 15 Gy.

Results: Of the 95 patients with a minimum 5-year follow-up, the median follow-up time was 85.6 months (mean 96.3 months). Overall tumor control was achieved in 85 of 95 patients (89%), of which tumor size was stable in 65% and decreased in 24%. Ten patients (11%) experienced progression of disease, with a mean time to progression of 79 months. The 10-year actuarial tumor control rate for all lesions was 86.5%. For nonfunctional adenomas, the 10-year actuarial tumor control rate was 91.1%, and for meningiomas it was 81.3%. Thirty-four percent of the patients with preoperative cranial nerve deficits had improvement. Toxicity was limited to new cranial nerve deficits in 3 patients (3%) and progressive endocrine insufficiency in 2 patients (2%).

Conclusions: GKRS has become the preferred management for many primary and subtotally resected benign tumors of the cavernous sinus. Long-term clinical and radiographic outcomes demonstrate excellent tumor control rates and a low toxicity profile. Tumor progression more commonly occurs 5-10 years following GKRS treatment, mandating long-term follow-up in all patients.

20. ***"Regional Neurosurgical Societies: Past, Present and Future"***
Randy Smith, MD, Escondido, CA

There are four regional neurosurgical societies in America, all with a storied history reaching back to the middle of the last century. The New England Neurosurgical Society and the Southern Neurosurgical Society are the oldest regional groups, both being founded in the late 1940's. The Western Neurosurgical Society was founded in 1955 and the Rocky Mountain Neurosurgical Society in 1965. All four societies continue to this day and all are committed to an annual meeting held in a resort location covering 2 to 4 days with afternoons free to enjoy the venue.

Each society's annual meeting program is scientific and composed of presentations by members and guests and features invited speakers and special lectures. All encourage resident participation with reduced or no registration fee and give prizes for best resident papers. All award CME credits.

The Southern is the largest group at 500+ members followed by the New England and Western at about 200 with the Rocky Mountain at 84. All groups have stable membership levels except for a decline in the Rocky Mountain, whose catchment area overlaps that of the Southern and Western. The Southern meets in late winter, the New England and Rocky Mountain in June with the Western in September-October. All require Boards for membership except the New England. Only the Western requires presentation of a paper prior to achieving membership.

The Western's demographics reveal half its members hail from California, half are or could be in the senior category and the other half is about evenly split between the young and middle-aged. Following an initial Hawaii meeting in 1968, the Western has returned 10 times, most often to the Kona Coast area of the big island. California has been the annual meeting site 19 times and only Montana and Mexico have not hosted an annual meeting.

Life expectancy for males in Hawaii is 75, and for females is 80 years of age.

21. ***"Moyamoya Disease: The Stanford Experience 1991-2011. What Have We Learned?"***

Gary Steinberg, MD, PhD, R Guzman, MD, M Lee, MD, N Khan, MD, P Pandey, MD, L Dorfman, MD, T Bell-Stephens, RN
Stanford University-Stanford, CA

Object: Moyamoya disease (MMD) is a rare, cerebral arteriopathy involving the proximal Circle of Willis vessels resulting in cerebral ischemia or hemorrhage, described mainly in the Asian literature. The etiology, genetics, angiographic and hemodynamic features, neurocognitive consequences and clinical outcomes after revascularization surgery in North American MMD patients are not well defined. We review our 20 year Stanford experience in treating MMD patients.

Methods: Between 6/1991- 6/2011 we performed 854 revascularization procedures on 516 MMD patients. We studied demographic and clinical characteristics, angiographic features, CBF measurements, blood DNA, histopathology of MCA, perioperative complications and clinical outcome.

Results: Half the patients were Caucasian with 1/3 Asian. 70% were female and 30% pediatric. Direct bypasses were performed in 95% of adults and 75% of children. Surgical morbidity was 3.5% and mortality 0.7%/ hemisphere (mean f/u 4.9 y). The 5 year risk of perioperative or subsequent stroke/death was 5.5%. Of patients presenting with TIAs, 92% were free of symptoms at ≥ 1 year. Females presented more frequently with TIAs. Thirteen patients were misdiagnosed with multiple sclerosis. Mean intraop MCA CBF increased 5x after STA-MCA bypass. High post-anastomosis MCA flow was associated with postoperative stroke, hemorrhage and transient neurologic deficits. Angioplasty/stenting was ineffective treatment and repeat revascularization was successful in 16 patients who failed initial indirect grafts. Twelve familial MMD families showed autosomal dominant inheritance with incomplete penetrance. Two novel, unique gene mutations were discovered that increased the risk of developing MMD. Preoperative cognitive impairment was found in 23% of patients with no MR evidence of ischemic stroke; executive functioning, mental efficiency, and word-finding were impaired, whereas memory was relatively intact.

Conclusions: North American MMD is being recognized more frequently. Surgical revascularization significantly improves clinical outcome with low risks. Further studies will determine if revascularization can improve cognitive function. Investigation of MMD genetics may lead to new treatments.

22. ***"Results of Lumbar-Peritoneal Shunts for the Treatment of Normal Pressure Hydrocephalus"***

Orin Bloch, MD, Michael W McDermott, MD
University of California at San Francisco-San Francisco, CA

Introduction: Ventriculo-peritoneal(VP) shunt placement is the current standard of care for idiopathic normal pressure hydrocephalus (NPH). Since the best predictive tests for the clinical benefit of shunting are a large volume spinal tap or extended lumbar drainage, we thought permanent CSF diversion from the lumbar theca was a reasonable alternative to VP shunting. Lumbar-peritoneal(LP) shunts may also avoid direct cerebral injury and may reduce the risk of overdrainage.

Methods: We retrospectively reviewed our experience with LP shunt placement for NPH patients from 2002 – 2009. Patients were evaluated by self-report and objective physical therapy evaluation for improvements in gait, incontinence, and dementia after shunt placement. All patients had evidence of ventriculomegaly on pre-operative imaging, and had a positive response to provocative testing with large volume lumbar puncture or temporary lumbar drain placement prior to LP shunt placement. All patients were evaluated independently pre-operatively by neurologists as to the value of shunting based on the results of provocative testing. Low-pressure horizontal-vertical valves were placed in all patients.

Results: 33 consecutive patients underwent LP shunt placement for idiopathic NPH. Mean patient age was 79 with approximately a 1:1 male to female ratio. All 33 (100%) patients had pre-operative gait dysfunction, 28 (85%) had urinary incontinence, and 20 (60%) had some degree of dementia. Mean follow-up time was 19 months. Following LP shunt placement, 33/33 (100%) of patients demonstrated improvement in gait, 13/28 (46%) had significant improvement in incontinence, and 11/20 (55%) had improvement in memory deficits. Shunt failures requiring revision occurred in 9 patients (27%), with an average time to shunt failure of 12 months. Failures occurred primarily due to proximal or distal catheter obstruction or migration. Infections occurred in 2 patients (6%), and 2 patients (6%) required revision for development of lumbar pseudomeningoceles. Importantly, unlike the experience with non-valved LP shunt systems, there were no cases of subdural hematoma or acquired Chiari malformations on follow-up imaging.

Conclusion: LP shunt placement is a safe and effective alternative to VP shunting for the treatment of NPH, resulting in significant improvement with a low risk of symptomatic overdrainage. In order to overcome problems of peritoneal catheter pull-out, we now place all peritoneal catheters with laproscopic techniques.

23. ***"Red Desaturation Testing: A Simple Bedside Method for Detecting Chiasmopathy in Patients with Pituitary Adenomas Compressing the Optic Chiasm"***

Andrew S Little, MD, E Shortridge, BS, L Knecht, MD, K Chapple, PhD
WL White, MD, University of Arizona College of Medicine;
Barrow Neurological Institute; St Joseph's Hospital- Phoenix, AZ

Introduction: Pituitary macroadenomas can cause visual field derangements by upward compression on the optic chiasm and optic nerves. Red desaturation is a simple bedside test that involves an assessment of the patient's perceived quality of red color and may be able to detect visual field deficits caused by pituitary adenomas. In this study, we evaluated the ability of red desaturation testing to detect chiasmal displacement and compared it to conventional methods of detecting visual field derangements commonly used by neurosurgeons.

Methods: Red desaturation testing was applied in the daily practice at our pituitary center. One hundred and ninety patients with nonfunctioning pituitary macroadenomas who underwent transsphenoidal resection between January 2005 and June 2010 were included in the study. The presence or absence of chiasmal displacement was assessed on MRI coronal contrasted images. Patients were assessed by red desaturation testing, confrontational field testing (CVF), and formal Humphrey visual field (HVF) testing. Data were evaluated by Chi-squared analysis and ANOVA.

Results: Red desaturation detected chiasm displacement with 64.7% sensitivity and 74.5% specificity, while CVF detected displacement with 23.7% sensitivity and 96% specificity. HVF detected displacement with 74.5% sensitivity and 80% specificity. Red desaturation occurred in 75.3% of patients with HVF deficit, whereas CVF deficit occurred in 33.8%. Red desaturation testing was significantly more likely to detect chiasmal displacement than CVF ($p < .001$). ANOVA analysis demonstrated no significant difference in displacement detection rates between red desaturation and HVF tests.

Conclusion: Red desaturation testing is a simple test that can easily be incorporated into everyday clinical practice for detecting visual field deficits caused by pituitary tumors. This method is superior to CVF and approaches the sensitivity of formal visual field testing. Future studies will determine if it is useful in other optic pathway derangements.

24. ***"Harnessing Surgical Brain Injury: Neurosurgeons Taking the Battle Home"***
John H Zhang, MD, PhD, ART Colohan, MD, FPK Hsu, MD, PhD
A Zouros, MD, F Asgarzadie, MD, Loma Linda University-Loma Linda, CA

Neurosurgical procedures cause injury to normal brain tissue even though this rarely leads to a fatal outcome. However, this "accepted postoperative complication" may prolong ICU and hospital stay, increase a neurosurgeon's liability, and prevent neurosurgeons from taking aggressive curative approaches. Preconditioning patients before elective surgery is possible, and may reduce injury to susceptible brain tissue.

This presentation will discuss potential causes, pathophysiology, and current non-selective treatment of surgical brain injury, surgical brain injury animal models, and preconditioning modalities, including hyperbaric oxygen and immunomodulation to reduce surgical brain injury.

Kauai is over six million years old.

25. ***"Efficacy and Evolution of the Socioeconomic Fellowship of the Council of State Neurosurgical Societies"***

Mark E Linskey, MD, DL Benzil, MD, N Hussain, MD, DA Lobel, MD
GM Bloomgarden, MD, W Bingaman, MD
University of California at Irvine- Irvine, CA

Objective: To outline the history, rationale, and initial results of implementing a new Council of State Neurosurgical Society (CSNS) resident socioeconomic (SE) fellowship program with special emphasis on the special need for-, and importance of-, socioeconomic education within the resident curriculum in neurosurgery, and the applicability of the model throughout individual neurosurgical training program curricula. To assess how detailed and iterative attention to program evaluations has dramatically improved program results, with more general implications for training programs beyond this fellowship.

Methods: Formal program evaluations from all CSNS SE fellows were collected over a period of two years. Changes in the program due to initial year feedback were assessed for effectiveness by comparing initial evaluation results to those obtained after the second year.

Results: Survey results collected from resident participants showed dramatic improvement in feedback scores after fundamental changes to introductory subject materials and improvements in the mentoring process were instituted. The fellowship program overall was rated a 4 on a 5-point maximum Lickert scale for both years. Introductory fellowship materials were rated 3 and 4, respectively, at the end of the first and second years. Initially poor mentoring scores also improved the second year after instituting a policy that the mentor must contact the resident before the first meeting, along with mentor training, was instituted. Overall, the CSNS SE Fellowship led to remarkable improvement both in residents' understanding of the purpose of the CSNS and its structure and function.

Conclusions: The CSNS SE fellowship program, which began in 2008, has provided an innovative simultaneous, parallel training, model for improving neurosurgery residency learning for those portions of the competencies of professionalism, systems-based practice, and practice-based learning and improvement that relate to SEs and health policy. Similar results and continued iterative improvements in training effectiveness can likely be achieved in similar subject areas within other medical specialty training programs.

26. ***"Cystic Vestibular Schwannomas"***
Steven Giannotta, MD, Parham Yashar, MD
University of Southern California-Los Angeles, CA

While vestibular schwannomas are typically solid, approximately 4-20% are cystic. This term should be reserved for those lesions that exhibit intrinsic cysts, not those associated with arachnoid cysts. Cystic schwannomas tend to be larger at presentation, exhibit capricious growth rates, cause more pre-treatment cranial nerve symptoms, and generate more treatment complications than their solid counterparts.

The authors present their experience with 22 cases of vestibular schwannomas with cystic degeneration. Results suggest less likelihood of total removal, poorer HB facial nerve scores, and more control failures with radiosurgery. A multirecurrent case will be presented that dramatically illustrates the adage: "Once a cystic tumor, always a cystic tumor." Current hypotheses as to the biological nature of the cystic degenerative process will be discussed.

According to Hawaiian legend, Moo, a giant lizard god, lives in the mountain pools above Hanalei.

27. ***"Computerized Image Guided Spine Surgery: The State-of-the-Art"***

J Patrick Johnson, MD, TT Kim, SS Vaynman, SS Ghostine, MS Turner, KR Woods, ML Grode, S Samudrala, RS Pashman
Cedars-Sinai-Los Angeles, CA

Introduction: Computerized image-guided spinal surgery has remained limited due to difficulties in applying intra-operative navigational technologies, with its slow development over the past decades largely due to difficulties with registration and inability to update imaging intra-operatively. Specifically, complex spine surgery for uncommon procedures has remained challenging due to limitations of fluoroscopy, artifacts related to previous operations, and difficult spatial orientation. We have been involved in the development of several generations of image-guidance surgery (IGS), whose application has recently been facilitated with the latest advances in intra-operative computer tomography (CT) imaging.

Methods: We have applied IGS to nearly every application in the spine and now report our experience with CT-based IGS in 100 spinal procedures (50 thoracic, 35 lumbar, 10 cervico-thoracic junction, and 5 sacral), considered complex anatomic and reconstruction problems. Patients were positioned on a fluoroscopic operating table to allow intra-operative CT imaging with the Medtronic O-arm. Standard fluoroscopic localization of surgical level(s) was confirmed and the CT scanner was positioned for image data acquisition, with an automatic registration process working in tandem with the image-guidance system for surgical navigation. Tracking arrays optimized trajectory and placement of surgical instruments, primarily the high-speed drill and screw placement. Accuracy was determined by recording known intra-operative landmarks with the IGS monitor and measuring the difference.

Results: All patients had successful image-guided procedures to achieve the desired surgical goal, with a 0% revision rate for screw malpositioning, hardware failure or infection. Registration was accomplished with a remarkably high accuracy. Procedure adequacy can also be determined using IGS and post-procedure CT imaging.

Conclusions: IGS has made significant advances in ease-of-use, primarily due to automatic registration developed to be intrinsic to the technology. This technology has great potential application for routine spinal procedures, and less invasive techniques, to ultimately reduce morbidity and improve outcomes.

28. ***"Paradoxical Apostasy from Effective and Safe Ethylene Oxide Sterilization of Human Bone Allografts. A 30 Year Experience"***
Donald J Prolo, MD, Sally A Oklund, PhD, San Jose, CA

At the 24th Annual Meeting of the Western Neurosurgical Society in Pebble Beach, October 1978, the authors first reported sterilization/lyophilization of bone and dura mater with ethylene oxide (EO) to rid tissues of bacteria, fungi, viruses and toxic substances, while preserving the integrity of the grafts for subsequent revascularization and remodeling. After procuring human allografts in a nonsterile environment and cleansing the tissues, technicians terminally sterilized allografts with EO, following which lyophilization was used to elute EO and its byproducts. Since then the responses of these allografts in thousands of patient applications over a 30-year period may be reported.

There have been no reports of infections or infectious diseases transmitted to recipients of soft and hard tissue allografts in nearly 100,000 human applications. Among 352 patients undergoing posterior lumbar interbody fusions by the authors over a 24-year period and followed for up to 30 years, there has been zero incidence of infection at the recipient graft site or transmitted systemic illness, associated with a very high fusion rate.

Over the last decade the tissue banking community has unscientifically and paradoxically suspended use of EO for terminal sterilization of human allografts. Alternative methods, including irradiation, have deleterious effects on tissue matrices.

Conclusion: The processing of soft and hard tissue allografts by terminal sterilization with ethylene oxide followed by lyophilization to rid the tissues of residual EO and its byproducts is effective, safe and withstood the test of 30-years of experience. The physical and biochemical integrity of allografts is virtually unaltered by this processing technique and allows incorporation and remodeling of the allografts by the host. Surgeons utilizing allogeneic tissues or their derived products must be aware of the techniques of tissue processing and their long-term biologic consequences in recipients of implants used in human surgery.

Notes

By law, no building on Kauai is allowed to be built taller than a palm tree.

ORGANIZATIONAL COMMITTEE

Frank M. Anderson*
Edwin B. Boldrey*
Howard A. Brown*
Herbert G. Crockett*
John Raaf*
Rupert B. Raney*
David L. Reeves*
C. Hunter Sheldon*

FOUNDING FATHERS

Robert B. Aird*
Frank M. Anderson*
Edwin B. Boldrey*
Howard A. Brown*
John D. Camp*
Herbert G. Crockett*
Henry M. Cuneo*
Edward M. Davis*
Robert S. Dow*
John D. French*
Hale A. Haven*
O.W. Jones, Jr.*
Edward K. Kloos*
Lester B. Lawrence*
Kenneth E. Livingston*
Frank W. Lusignan*
Ernest W. Mack*
Theodore Magoun*
Edmund J. Morrissey*
Henry W. Newman*
Nathan C. Norcross*
Robert H. Pudenz*
John Raaf*
Robert W. Rand
Aidan Raney*
Rupert B. Raney*
David L. Reeves*
Augustus S. Rose*
C. Hunter Sheldon*
W. Eugene Stern
Frank Turnbull*
Karl O. Von Hagen*
Arthur A. Ward. Jr.*
Delbert Werden*
Ward W. Woods*

*deceased

DECEASED SOCIETY MEMBERS

(expired while a member, non-officers or founders)

Kenneth H. Abbott

Eben Alexander, Jr.

James R. Atkinson

Thomas S. Bennett

Irvin H. Betts Jr.

David Brown

John D. Camp

Norman L. Chater

Cyril B. Courville

John B. Doyle

Charles W. Elkins

Attilla Felsoory

Robert D. Fiskin

Anthony Gallo

Leslie Geiger

John W. Hanbery

Hale A. Haven

William Hyman

O. W. Jones

Alexander Johnson

John C. Kennady

Peter A. Lake

James Lansche

Lester B. Lawrence

Grant Levin

Frank W. Lusignan

John S. Marsh

Robert Morelli

Richard Newquist

William A Newsom

Hal Pittman

John C. Oakley

Carl W. Rand

Aidan Raney

Nat D. Reid

Ted Roberts

Adolf Rosenauer

Alan W. Rosenberg

Robert L. Scanlon

Harry F. Steelman

A. Earl Walker

W. Keasley Welch

William Wright

Eric Yuhl

Edward Zapanta

PAST SECRETARY-TREASURERS

Herbert. Crockett*	1955, 1956, 1957
Ernest W. Mack*	1958, 1959, 1960
Samuel W. Weaver*	1961, 1962, 1963
James R. St. John*	1964, 1965, 1966
Robert W. Porter	1967, 1968, 1969
William A. Kelly	1970, 1971, 1972
John S. Tytus	1973, 1974, 1975
Theodore S. Roberts*	1976, 1977, 1978
Ulrich Batzdorf	1979, 1980, 1981
John A. Kusske	1982, 1983, 1984
W. Ben Blackett	1985, 1986, 1987
Francis E. LeBlanc	1988, 1989, 1990
Melvin L. Cheatham	1991, 1992, 1993
Grant E. Gauger	1994, 1995, 1996
Randall W. Smith	1997, 1998, 1999
Moustapha Abou-Samra	2000, 2001, 2002
Hector E. James	2003
Austin R. T. Colohan	2004, 2005, 2006
Jeffery L. Rush	2007, 2008, 2009
Charles E. Nussbaum	2010

PAST HISTORIANS

Henry M. Cuneo*	1962-1966
Ernest W. Mack*	1967-1971
Donald B. Freshwater*	1972-1976
George Ablin*	1977-1982
Gale C. Clark*	1983-1984
Robert Rand	1985-1990
Frank P. Smith*	1991-1995
John C. Oakley*	1996-1999
John P. Slater	1999-2002
John T. Bonner	2002-2008
Randall Smith	2009-2010

*deceased

PAST MEETINGS OF THE SOCIETY

1.	Biltmore Hotel, Santa Barbara, CA	Nov 25-26, 1955
2.	Timberline Lodge, OR	Dec 9-11, 1956
3.	Holiday Hotel, Reno, NV	Sept 29-Oct 1, 1957
4.	Del Monte Lodge, Pebble Beach, CA	Oct 19-22, 1958
5.	La Valencia Hotel, La Jolla, CA	Sept 27-30, 1959
6.	Del Monte Lodge, Pebble Beach, CA	Oct 23-26, 1960
7.	Bayshore Inn, Vancouver, BC	Oct 29-Nov 1, 1961
8.	Camelback Inn, Phoenix, AZ	Oct 28-31, 1962
9.	El Mirador Hotel, Palm Springs, CA	Oct 20-23, 1963
10.	Fairmont Hotel, San Francisco, CA	Oct 18-21, 1964
11.	Olympic Hotel, Seattle, WA	Oct 3-6, 1965
12.	Hotel Utah, Salt Lake City, UT	Nov 6-9, 1966
13.	Kona Kai Club, San Diego, CA	Oct 15-18, 1967
14.	Mauna Kea Beach Hotel, Kamuela, HI	Nov 16-19, 1968
15.	Del Monte Lodge, Pebble Beach, CA	Oct 15-18, 1969
16.	Bayshore Inn, Vancouver, BC	Oct 4-7, 1970
17.	The Broadmoor, Colorado Springs, CO	Oct 31 -Nov 3, 1971
18.	The Skyline Country Club, Tucson, AZ	Oct 29-Nov 1, 1972
19.	Airport Marina Hotel, Albuquerque, NM	Sept 16-19, 1973
20.	Santa Barbara Biltmore Hotel, CA	Oct 27-30, 1974
21.	Mauna Kea Beach Hotel, Kamuela, HI	Sept 28-Oct 1, 1975
22.	Harrah's Hotel, Reno, NV	Sept 26-29, 1976
23.	La Costa Resort Hotel, Carlsbad, CA	Sept 18-21, 1977
24.	The Lodge, Pebble Beach, CA	Oct 8-11, 1978
25.	Camelback, Inn, Scottsdale, AZ	Sept 23-26, 1979
26.	Mauna Kea Beach Hotel, Kamuela, HI	Sept 21-24, 1980
27.	The Empress Hotel, Victoria, BC	Sept 20-23, 1981
28.	Jackson Lake Lodge, Jackson Hole, WY	Sept 12-15, 1982
29.	Hotel del Coronado, Coronado, CA	Oct 2-5, 1983
30.	The Broadmoor, Colorado Springs, CO	Sept 9-12, 1984
31.	Silverado Country Club & Resort, Napa, CA	Sept 22-25, 1985
32.	Maui Intercontinental, Wailea, Maui, HI	Sept 28-Oct 1, 1986

PAST MEETINGS OF THE SOCIETY

33. Banff Springs Hotel, Banff, AB	Sept 6-9, 1987
34. The Ritz-Carlton, Laguna Niguel, CA	Sept 11-14, 1988
35. The Lodge, Sun Valley, ID	Sept 10-13, 1989
36. Mauna Lani Bay Hotel, Kawaihae, HI	Sept 9-12, 1990
37. The Pointe, Phoenix, AZ	Sept 22-25, 1991
38. The Whistler, Whistler, BC	Sept 20-23. 1992
39. Mauna Lani Bay Hotel, Kawaihae, HI	Sept 19-22, 1993
40. Le Meridien Hotel, SanDiego, CA	Sept 18-21, 1994
41. Salishan Lodge, Gleneden Beach, OR	Sept. 9-12, 1995
42. Manele Bay, Island of Lanai, HI	Sept 14-17, 1996
43. Ojai Valley Inn, Ojai, CA	Sept 20-23, 1997
44. Silverado Resort, Napa, CA	Sept 12-15, 1998
45. Coeur d'Alene Resort, Coeur d'Alene, ID	Sept 18-21, 1999
46. Mauna Lani Bay Hotel, Hawaii, HI	Sept 9-11, 2000
47. Ocean Pointe Resort, Victoria BC (Cancelled)	Sept 15-18, 2001
48. Delta Victoria Resort, BC	Oct 12-15, 2002
49. Hapuna Beach Prince Hotel, Kamuela, HI	Sept 20-24, 2003
50. Rancho Bernardo Inn, San Diego, CA	Sept 11-14, 2004
51. Squaw Creek Resort, Lake Tahoe, CA	Sept. 17-20, 2005
52. Semiahmoo Resort & Spa, Blaine, WA	Sept. 16-19, 2006
53. Mauna Lani Bay Hotel, Kawaihe, HI	Sept. 8-11, 2007
54. Hotel Captain Cook, Anchorage, AK	Aug. 16-19, 2008
55. Sun River Resort, Bend, OR	Sept. 11-14, 2009
56. Eldorado Hotel, Santa Fe, NM *In Memory of L. Philip Carter*	Oct 8-11, 2010

FUTURE MEETINGS

Broadmoor Hotel, Colorado Springs, CO	September 7-10, 2012
Ritz Carlton, Half Moon Bay, CA	September 15-18, 2013

PAST VICE-PRESIDENTS

John Raaf*	1955
Frank Turnbull*	1956
Howard A. Brown*	1957
Rupert R. Raney*	1958
Edmund J. Morrissey*	1959
C. Hunter Sheldon*	1960
Ernest W. Mack*	1961
Hale A. Haven*	1962
Frank M. Anderson*	1963
Edwin B. Boldrey*	1964
Herbert C. Crockett*	1965
Karl O. Von Hagen*	1966
Samuel W. Weaver*	1967
Chester B. Powell*	1968
Peter O. Lehman*	1969
Charles W. Elkins*	1970
Nathan C. Norcross*	1971
James R. St. John*	1972
Edward K. Kloos*	1973
Ralph B. Cloward*	1974
Thomas K. Craigmile*	1975
Lyman Maass*	1976
Gale C. Clark*	1977
William A. Kelley	1978
Byron C. Pevehouse	1979
Robert W. Rand	1980
Theodore S. Roberts*	1981
Ulrich Batzdorf	1982
George Ablin*	1983
George A. Ojemann	1984
Gale C. Clark*	1985
Robert Weyand	1986
Robert Florin	1987
John A. Kusske	1988
Basil Harris	1989
W. Ben Blackett	1990
Ronald F. Young	1991
Edward Reifel	1992
Grant E. Gauger	1993
Ralph F. Kamm	1994
Steven L. Giannotta	1995
Randall W. Smith	1996
Gail A. Magid	1997
Donald Prolo	1998
Lawrence Shuer	1999
John C. Oakley*	2000
L. Philip Carter*	2001, 2002
William L. Caton III	2003
Gerald Silverberg	2004
Kim Burchiel	2005
John Adler	2006
Philip Weinstein	2007
Betty MacRae	2008
Linda Liau	2009
David W. Newell	2010

*deceased

PAST PRESIDENTS

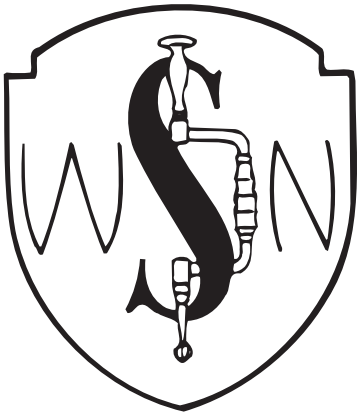
David L. Reeves*	1955
John Raaf*	1956
Frank Turnbull*	1957
Howard A. Brown*	1958
Rupert R. Raney*	1959
Edmund G. Morrissey*	1960
C. Hunter Sheldon*	1961
Ernest W. Mack*	1962
Hale A. Haven*	1963
Frank M. Anderson*	1964
Edwin B. Boldrey*	1965
John R. Green*	1966
Arthur A. Ward, Jr.*	1967
Lester B. Lawrence*	1968
John D. French*	1969
Chester B. Powell*	1970
Robert W. Porter	1971
Henry M. Cuneo*	1972
Edward K. Kloos*	1973
W. Eugene Stern	1974
Ralph B. Cloward*	1975
James R. St. John*	1976
Eldon L. Foltz	1977
John Tytus*	1978
Donald B. Freshwater*	1979
William A. Kelly	1980
Byron C. Pevehouse*	1981
Robert W. Rand	1982
Theodore S. Roberts*	1983
Thomas K. Craigmile*	1984
Ulrich Batzdorf	1985
Gale C. Clark*	1986
Lyman Maass*	1987
Gordon B. Thompson	1988
George Ablin*	1989
Robert Weyand	1990
Basil Harris	1991
W. Ben Blackett	1992
Francis E. LeBlanc	1993
Ronald F. Young	1994
John A. Kusske	1995
Melvin L. Cheatham	1996
Robert Florin	1997
Frank P. Smith*	1998
Ralph F. Kamm	1999
Steven L. Giannotta	2000
Donald J. Prolo	2001, 2002
Grant E. Gauger	2003
Randall W. Smith	2004
John P. Slater	2005
Moustapha Abou-Samra	2006
Kim Burchiel	2007
Gerald Silverberg	2008
Lawrence Shuer	2009
L. Philip Carter*	2010
David W. Newell	2010

*deceased

PAST RESIDENT AWARD RECIPIENTS

Linda M. Liau, UCLA **	1997
Sean D. Lavine, USC	1998
Sooho Choi, USC	1999
Michael Y. Wang, USC	2000
Odette Harris, Stanford	2001
Raymond Tien, OHSU	2002
Michael Sandquist, OHSU	2003
Iman Feiz-Erfan, BNI	2004
Johnathan Carlson, OHSU	2005
Mathew Hunt, OHSU	2005
Kiarash Golshani, OHSU	2006
Edward Chang, UCSF	2006
Jonathan Miller, OHSU	2007
Kenneth Liu, OHSU	2007
Justin Cetas, OSHU	2008
Edward Chang, UCSF	2008
Zachary Litvack, OHSU	2009
Kiran Rajneesh, UCI	2009
Justin Dye, UCLA	2010
Isaac Yang, UCSF	2010

**WNS Member



MEMBER GEOGRAPHICAL LISTING

The movie Jurassic Park was shot on Kauai during hurricane Iniki and uses actual footage of the event in the movie.

ALASKA

Anchorage
John C. Godersky, M.D.

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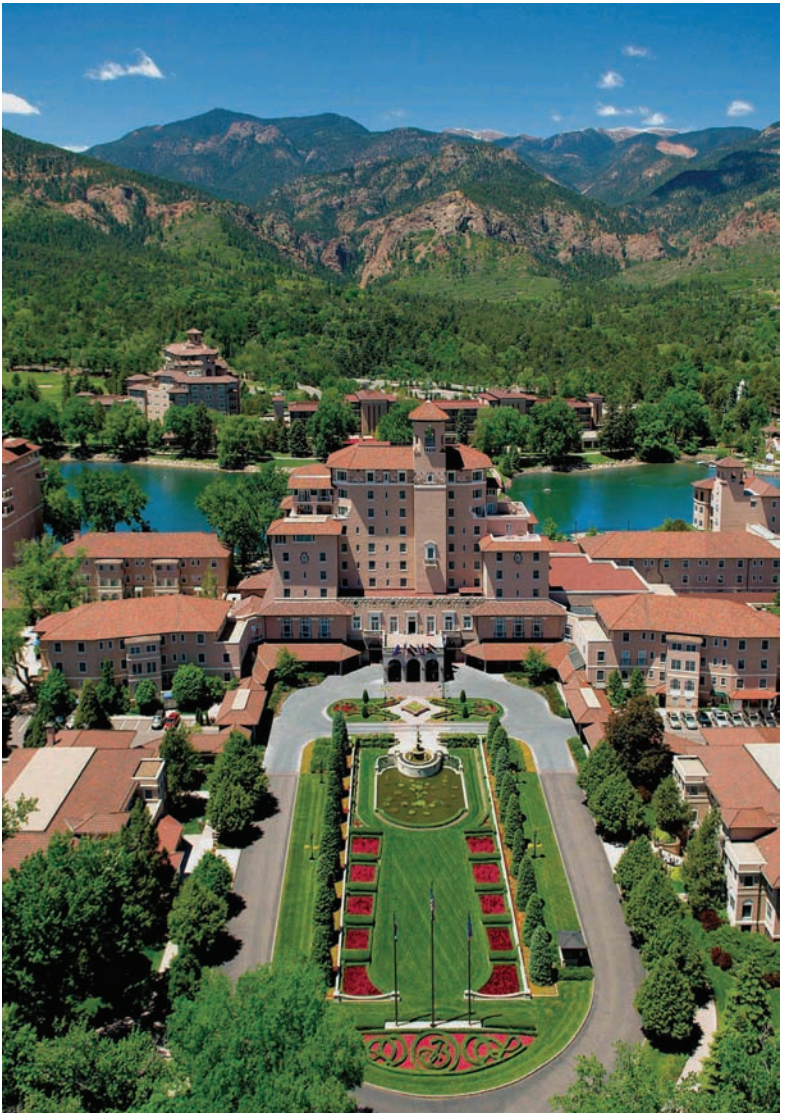

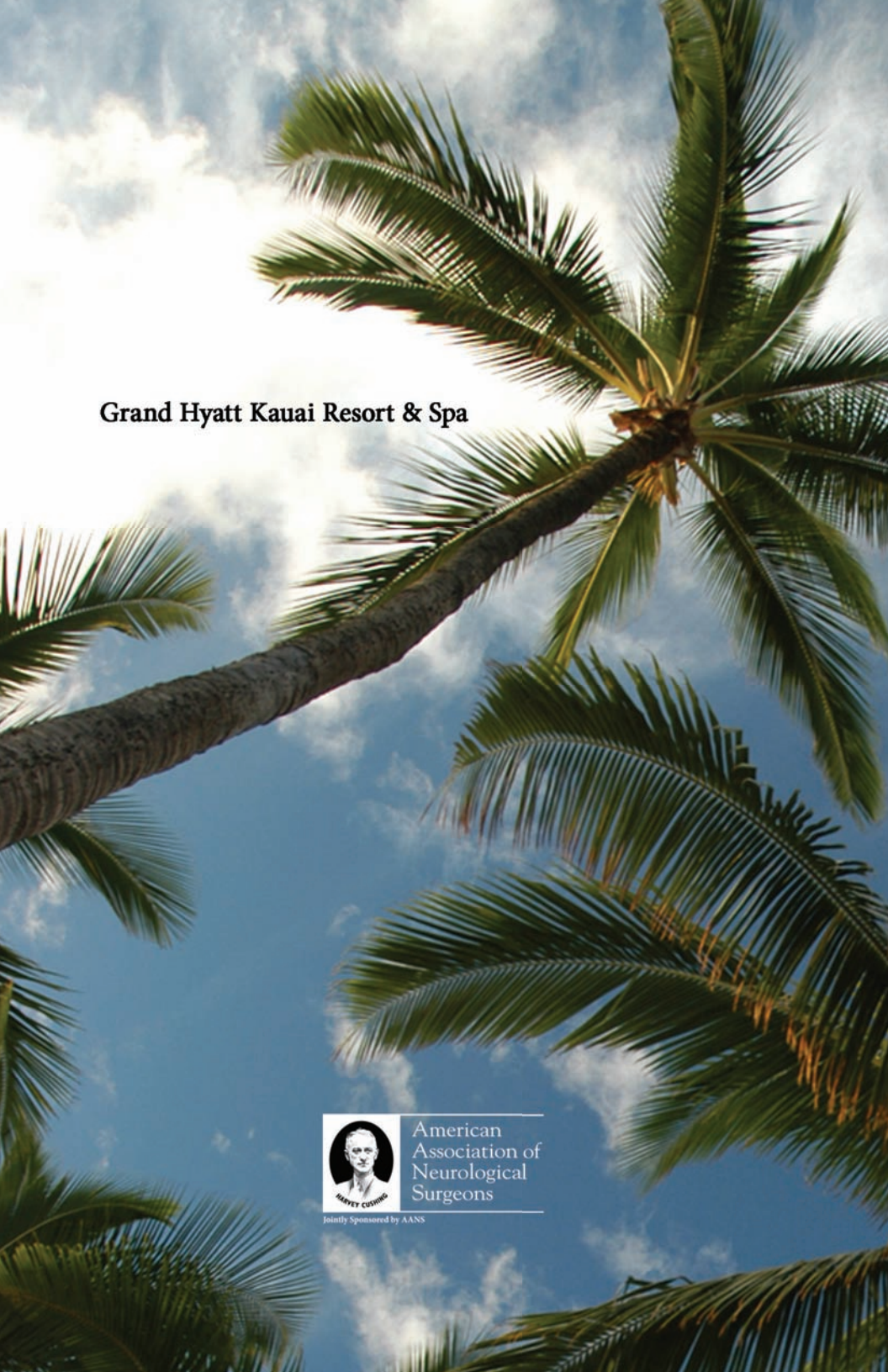
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