

David Kopf Instruments Celebrates 40 Years of Service to the Neuroscience Community



In 1956 David Kopf started David Kopf Instruments. This issue of the Carrier is devoted to a celebration of those 40 years of service to the community now known as the neurosciences.

Investigations into brain function would not be nearly as advanced as they are now without the precision of the stereotaxic instruments available for animal use. The development of these instruments is tied heavily to the David Kopf Instruments company and its founder, David Kopf. In the pages that follow, the history of the company is outlined from interviews with David and Carol Kopf (pictured above), and comments from some early users of Kopf equipment are presented. Please join us in the celebration of the fortieth anniversary of David Kopf Instruments.

Michael M. Patterson, Ph.D.
Carrier Science Editor

The success of every physical and biological science is tied to its instrument makers. Even if the scientist knows the direction of the road which must be followed, it is often necessary to await the appropriate technical vehicle before the trip can proceed. Such was the case with investigations of brain structure-function relationships early in the 1800s. As pointed out by Marshall and Magoun in the October, 1990 *Carrier*, "The encumbrance of a lack of precision in the placement of a lesion or stimulus in brain tissue delayed progress in neuroscience from the time when significant experimental neurophysiology commenced." As early as 1823, Pierre Flourens recognized "...the handicap of imprecision...regarding the properties and functions of the vertebrate nervous system." (Marshall and Magoun, *Carrier*, 1990, 27).

Continued on page 2, col. 2



Editor's Column

This issue of the *Carrier* is dedicated to David and Carol Kopf and their contribution to our science as shown by their dedication to excellence through

David Kopf Instruments. There are others who have served the company for many years who also should be recognized. Without them, the high quality Kopf instruments we use would simply not be possible. I have listed their names and years of service to us through David Kopf Instruments.

Years	Name	Position
40	J. David Kopf	President
34	Carol Kopf	Treasurer
28	Bobbie Foote	Manager, Customer Service
18	Mark Newman	Foreman, Machine Shop
17	Ed Herbig	Leadman, Mechanical Assembly
15	Vic Olszewski	Customer Service Technician
12	Sam Zamudio	Journeyman Machinist
12	Bert Altman	Senior Mechanical Designer
12	Ernie Zamudio	Asst. Foreman & CNC Lathes
12	Jim Styer	Leadman, CNC Milling Machines
11	Dick Wilder	R&D Machinist
11	Chuck Wright	Sr. Electronic Designer
9	Dan Renwick	R&D Machinist/Toolmaker
9	John Sand	Machinist
8	Dawn Gelsinger	Customer Service Coordinator
8	Francisco Sandoval	Journeyman Machinist/Inspector
8	John Slater	Maintenance
7	Mary Hendrix	Electronic Inspector/Assembler
6	Ron Endicott	Manager, Production Control/Purchasing
5	Annie Panameno	Electronic Assembler
5	Arturo Torres	Apprentice Machinist

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Scientists interested in studies of brain function began seeking ways to enhance the precision with which lesions could be placed in deep brain structures in the mid and late 1800s. Around the turn of the century, Frederick Trendelenburg, a German physician-surgeon had developed the "myelotome" to position a knife for lesion making. Later, Robert Clarke and Victor Horsley designed a true stereotaxic device and described it in 1906. The development of the Horsley-Clarke stereotaxic instrument was truly a momentous step in the field of brain study. Over the ensuing years, several versions of the Horsley-Clarke stereotaxic machine were built, and most later machines were patterned after it.

The first American instrument was built about 1930 at Northwestern University and was used there by Rex Ingram in Ransom's institute. By 1947, there were about 50 stereotaxic machines in use, most made in the U.S. by Mr. Kittle, a machinist at the University of Chicago. Thus, by the early 1950s, the use of stereotaxic instruments was beginning to be accepted in brain sciences. (Much of this information came from Louise H. Marshall, Ph.D., personal communication, 1996.)

It was at about this time that David Kopf, who had worked as an R&D machinist and supervisor in aircraft manufacturing and had a small machine shop in his garage, was told by his brother-in-law that scientists at White Memorial Hospital in Los Angeles needed a stereotaxic device. Copying a Labtronics instrument, Kopf made parts for three machines; the first went to White Memorial and the second to C.G. Gunn.

In 1957, Kopf finished the third machine for Nat Buchwald. Over the next days and weeks, this machine was redesigned with the help of Buchwald, who taught David the intricacies of stereotaxis. They developed the geometry and features that became the Kopf stereotaxic. The next instrument, completely done in the new design, was delivered to Ross Adey in a cat food box, wrapped in aluminum foil. Almost immediately, he had orders for four more instruments, and sold these (including head holder, four electrode carriers and the frame) for \$850 each.

The company started by Kopf in his garage in Tujunga in 1956 moved to its present location in Tujunga in 1960. As Kopf expanded the line of instruments available for his frames, the business grew and more employees were added. The UCLA Brain Research Institute was the first institution to become a large user of Kopf instruments.

In 1962, a new employee joined the company

and in 1963, David married Carol, who now handles the administrative and financial aspects of the company.

In 1972, the company expanded with the addition of a medical instruments division which made dialysis equipment and an ophthalmological division (1974) which made a variety of surgical instruments. In 1976 and 1981 respectively, these divisions were sold, and David again focused on the core business of stereotaxic instruments and accessories.

Over the 40 years of its existence, David Kopf has designed and adapted many different instruments for stereotaxic use. The company can now supply a head adapter for almost any animal used by the neuroscience community. The wide range of devices available to the neuroscientist allows almost unlimited freedom to explore brain function in animals. The road from 1956 to the present for the technology of stereotaxis has indeed been an eventful one and refinement of the stereotaxic instrument as evidenced by Kopf instruments has allowed for a tremendous expansion of knowledge of brain function.

Today, David Kopf Instruments employs about 30 people and uses the most advanced machining and design tools available to make its instruments. Without the variety and precision developed by the company in stereotaxic technology over the last 40 years, it is clear that neuroscience would not have advanced as far as it has.

David and Carol Kopf have other interests besides the instrument company. David has for many years collected mechanical music machines, with an emphasis on fairground organs. In 1977, he brought one of these, the Mighty Ruth, to the seventh Society for Neuroscience meeting in Anaheim and played it. He had renovated the Ruth at that time, and is currently in a second restoration of the magnificent instrument. He has many other such pieces, most of which he has restored, making many of the pieces needed himself. He is also an accomplished wood carver. He has collected many fine examples of carousel animals from the old rides. He has even carved a full-size wooden carousel horse. In addition, he carves ivory and wood miniatures under a dissecting scope, and has recently begun to engrave intricate scenes on metal, such as knives. He and Carol have extensive collections ranging from historic postcards to miniature cameras and knives.

Over the past ten years, David has entered the auto racing field. Beginning with racing classic automobiles, such as his 1960 Porsche RS60, one of only 12 built, David has raced at Sebring and

all the other major road race courses in the U.S. In 1989, he became the only American to win a 100 mile race at Nurburgring in Germany. He has not only won many races, but was voted 1991 Driver of the Year by the Sportscar Vintage Racing Association. David and Carol have formed a new Precision Race Products Division within the company to build racing car parts, and David is currently building his own WSC (World Sports Car) which he plans to race in IMSA events at Daytona and Sebring before taking it to Le Mans. So, after 40 years, David and Carol are still entering new and challenging areas.

In addition to their many interests and activities, the Kopf's have also helped many in the neuroscience community in various ways. David Kopf Instruments was one of the very first Associate Members of the new Society for Neuroscience after its formation in 1970. Also, they have recently become an associate member of the International Society for the History of Neurosciences. David restored and built display and travel cases for the second original Horsley-Clarke stereotaxic instrument now on display at the UCLA Brain Research Institute Neuroscience Museum. Through the company, the Kopf's have sponsored many workshops on the use of stereotaxic instruments and electrode pullers, and have helped many young neuroscientists on the road to using stereotaxic techniques.

As a way to add to the flavor of 40 years of service and development of stereotaxis for neuroscience presented here, the Editor has asked five prominent neuroscientists to add their insights.

Drs. Louise H. Marshall, Nathaniel A. Buchwald, Ross Adey, Donald B. Lindsley, and Edward R. Perl have contributed these glimpses of the history of modern stereotaxis through their interactions with David Kopf Instruments. Our thanks to them for sharing these memories.

Two unusual characteristics of the David Kopf Instruments Company are an enthusiasm for preservation of the past and an appreciation of the fun of nostalgia. Those characteristics appear at all levels of the company because of the role models that Carol and David represent. It has been my privilege to witness several examples of this tendency.

At an annual meeting of the Society for Neuroscience (Eds. note, Anaheim, 1977), I came across a rehabilitated calliope on one of the spacious sunny terraces outside the meeting rooms at the convention center and realized that here is a company that appreciates and gets a kick out of history. There the organ was, ready to sing in all

its bright paint and glitter, preserved from an earlier era when it had been pushed through the streets and reminding us that fun remembered doubles the cheer.

Any company that has time and energy for the past enjoys being in business and that is certainly the case with Kopf. When David learned that the second unit of the stereotaxic instrument manufactured in London in 1908 according to the design of Robert Clarke and Victor Horsley was nearby at UCLA, stored in a carton and occasionally shown by its owner, Horace Magoun, to visitors, the company offered to refurbish it. The transfer was arranged, and a few months later, two large, very professional-looking shipping cases were delivered to Magoun. One case was made for the instrument itself, now completely assembled and sparkling from its brilliant brass surfaces giving it the appearance of a lacey jewel. The other case held the Plexiglas shell with a brass hook from which to suspend the harness that holds the headpiece and movable guides. Safe in its custom-made shipping box, this beautiful instrument has traveled to meetings as well as being on display in the conference room of the Brain Research Institute of UCLA.

A bibliography of stereotaxic atlases showing the coordinates for placement of electrodes has been printed, updated and distributed by David Kopf Instruments. This publication combines history with a research resource in a manner that few companies undertake. Congratulations on forty years of service to the brain sciences.

Louise H. Marshall, Ph.D.
UCLA

It was late fall in 1957 when someone knocked on my door in the Long Beach VA Hospital. The man who came in was lean, redheaded and alert. He said he was a design machinist and his brother-in-law, a neurosurgeon at the VA Hospital had told him about "brain machines." He (let's call him David) had built one of these designed after an existing "stereotactic" instrument and he was looking for someone to test it out. My boss, Dr. Tom Sawyer, had suggested me (probably because I was the most junior UCLA faculty member.)

Well, we tried out David's machine and I told him what was wrong with it (i.e., it was a mere copy of an existing instrument that wasn't much good). For two hours, we discussed how to make it better. When David came back the next week, he had it all figured out and I was lucky enough to get M1 of the Kopf Stereotaxic Instrument. This began an almost 40 years (now) friendship. I have followed the ups and downs of Kopf En-

terprises closely since those first days. In fact, over dinner with Dave and Carol a day or so ago, we reminisced over the early days and agreed (although we didn't know it then) those were the best times of our lives.

Nathaniel A. Buchwald, Ph.D.
UCLA

The late 1950's were formative years for the UCLA Brain Research Institute. It was staffed by a strong cadre of young researchers, recruited by Professor Horace Magoun from leading centers in neurological research around the world. In turn, they attracted kindred spirits as visiting scholars, all eager to pursue the goal of understanding brain mechanisms in consciousness and learning.

The universal research tools were electrophysiological, aimed at identifying the nuances of cerebral pathways identified by a variety of electrical signal patterns. But then, as now, we were technology limited. Repeated placement of intracerebral electrodes, from place to place and time to time, required a reliability and ingenuity that challenged the limits of the mechanical engineering arts.

It was here that David Kopf and a few others in a small band of medical engineering acolytes made great strides in developing recording devices and systems. It was my privilege to have one of the first two prototypes of the Kopf stereotaxic instruments, designed for studies in small mammals. It met in elegant detail all major requirements for a robust instrument, simple in design yet flexible in application to frequently changing research goals.

At a later time, with more sophisticated research demands, there grew a need to record activity of single brain cells in awake animals, David Kopf produced a small microelectrode drive, to be used in conjunction with a permanently attached skull mount. It was an accomplishment worthy of the watchmaker's art.

For these things, David Kopf has earned a lasting place in the history of engineering in the neurosciences. More importantly, he will be remembered as a warm and friendly colleague, as one who has spared no effort to meet the overwhelming and sometimes highly impractical demands of the neurophysiological researcher.

Ross Adey, M.D.
Pettis Memorial VA Medical Center

Congratulations to David Kopf upon the founding of the David Kopf Instrument Company 40 years ago. Due to David's genius as a de-

signer, builder, and manufacturer, brain researchers ever since have had a paramount source of stereotaxic instruments and accessories for both large and small animals. His stereotaxic instruments are known for their sturdiness, precision, and adaptability. David has always sought to determine precisely what the brain scientist wanted and needed. In this regard, at American Physiological Society and Society for Neuroscience meetings, David and his wife, Carol, could annually be found with an exhibit of their equipment, but would use the opportunity to discuss with the researcher any special needs. Furthermore, David has always been a liberal contributor to the financial needs of these societies. The publication, *Kopf Carrier*, with Michael Patterson as editor, keeps readers informed of new methods, instrumentation, and results of studies. With personal regards and best wishes to the Kopfs.

Donald. B. Lindsley, Ph.D.
Santa Monica, CA

In the late 1950's my laboratory at the University of Utah was doing experiments in cats and monkeys on the functional properties of the spinal somatosensory projection to the thalamus. The work depended upon the use of a stereotaxic device for thalamic recording. However, the experiments also required a laminectomy. We acquired a stereotaxic frame for the cat skull made by a fellow from California, David Kopf. It was said he had worked with people from the Brain Research Institute at UCLA. The quality of the machining on the stereotaxic headframe was impressive, however, the frame did not allow a ready coupling to a suitable mount for the lower spinal cord. To support the spinal region, we used a system and an animal board that had evolved from an arrangement used by David P.C. Lloyd at the Rockefeller Institute in the 1940's. A number of people who visited the laboratory wanted to have copies of our spinal support system. We had a one-person machine shop that couldn't provide service to others. On encountering this red headed, muscular Kopf person at a meeting, we spoke about the need for electrode holders and support of the spinal cord in conjunction with stereotaxic studies or independently for work on the spinal cord. Subsequently, I talked to David by telephone and at meetings a number of times and we became quite friendly.

I encouraged David to come visit us in Salt Lake City and take a look at our spinal clamping arrangements as they were used. Finally, in early 1964 he decided to visit Salt Lake City, driving from Los Angeles. We lived in a house on the side of Mt. Olympus. David was coming with his

bride of about a year, Carol. He made it to the house, creating a neighborhood sensation. He was driving a dark colored Ferrari coupe, a car that neither I nor any of our family had ever seen close at hand. It was low-slung, long-hooded, and powerful looking, just right for the handsome lady in the passenger seat. The scene hardly fit in the staid Salt Lake City neighborhood. My young son's eyes practically popped from his head. That coming was a great success. Son John and our girls had a ride in the wonderful "go" machine. This, then not so husky guy, David Kopf, was firmly etched in our children's brain. For the real purpose of his trip, he saw the layout for the animal board, hip holders, and vertebral clamps as they were used and took samples back to California. The result was a series of spinal holders for *in vivo* work on medium-sized laboratory animals.

After this foray into apparatus for spinal cord experimentation, apparently a success, I visited David in California on several occasions. From time to time we spoke about other devices that might be useful for electrophysiological work. One had to appreciate the terrific sense David has for working metal and the design of devices to mechanically manipulate things like small electrodes. Among other things, we had a mutual interest in microdrive devices. In the late 1960's we mounted a stepping motor onto one of his hydraulic drives. This proved so successful that he incorporated the feature as a product. Then there were changes in the glass microelectrode pullers.

Everything the man did was aimed at the highest quality, in the best tradition of his heritage. His passion for precision and quality was matched by an appetite for food and drink. He loved to have a good time and with his success, his girth expanded! There is a bit of living on the edge in this fellow. Every once in a while his stories of strange encounters made me wonder: The thief attempting to break into his factory in Tujunga on a weekend and the "piece" he used as discouragement; on another occasion, descriptions of instances on the streets of New Orleans. Would our friend survive to come up with a new mechanical gadget for neuroscience? At no time has that concern been riper than in recent years since he has taken to the racetrack in those fancy horseless carriages. David has been a great friend and a wonderful assistance for research on the central nervous system. Salute!

Edward R. Perl, M.D.
University of North Carolina
Chapel Hill

Plan to see our display, the largest in the world of stereotaxic instruments, microdrives and needle/pipette pullers, at the Society for Neuroscience Meeting, booths 1011 and 1013, November 17-20, 1996, in the Washington Convention Center.

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For 40 years, David Kopf Instruments has served the Neuroscience community with the best, largest and most continually expanding line of stereotaxic equipment available anywhere. Please stop by the David Kopf Instruments booth, visit with David and Carol and help them celebrate 40 years of service to the Neurosciences.