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# Donald J. Reis, MD: Research Mentor Extraordinaire

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**SUMMARY**

Donald J. Reis, M.D., the late internationally reknowned neuroscientist, had a special talent for mentoring researchers early in their academic careers. His "hands-on" approach to laboratory investigation, his extraoridinary patience with novice researchers, his commitment to the scientific method, and his enthusiastic approach to the art of neuroscience all combined to make him the ideal mentor for many budding academics over the past four decades. The beauty of his scientific legacy is that he loved to each research. The following tribute is personal from one whose career was changed by a great mentor.

**KEY WORDS:** mentor; research training; career development.

I first met Don Reis in the spring of 1968. At that time, he was a faculty member in the Department of Neurology at New York Hospital – Cornell Medical Center. He had an active research laboratory complete with a fellow and extramural funding. His research focused on blood pressure responses influenced by the fastigial nucleus of the cerebellum. I was a midlevel resident in neurosurgery at that same institution in a training program that did not emphasize research for its trainees. I had 6 months off the clinical service in my 3rd year of training in neurosurgery. Russel Patterson, a junior faculty member in the Division of Neurosurgery, introduced me to Don with the expectation that I would find him to be a good mentor and have the opportunity to develop a project and publish a paper. It all sounded simple to me. I had no research experience, had never developed a hypothesis, had no money for investigation, and had never published a paper. All I had was 6 months and an agreement with Don to get started. I did not realize at the time that this was a turning point in my career and my life.

Blood pressure responses to stress had always interested Don. One of the classic responses was described by Harvey Cushing after his "Wanderjahre" abroad when he had completed his training in surgery at Johns Hopkins Hospital in Baltimore (Cushing, 1901, 1902). Don convinced me that we should explore the effect of raised intracranial pressure on blood pressure in anesthetized cats, utilizing a brain

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compression model that had been developed earlier in other laboratories (Jennett and Stern, 1960; Weinstein *et al.*, 1964). We scrounged a corner in a vacant laboratory, bought a Kopf head holder for cats, appropriated some surgical tools from the operating room, borrowed an operating table from the dog lab, found a heating pad with temperature feedback, and rejuvenated a strip chart recorder. We also found a ventilator that worked. Tools were in place, space had been secured, and time had been allocated. We then turned to our hypothesis.

It had been known since 1901 that acute elevation of intracranial pressure caused a rise of systemic blood pressure and fall of heart rate. This was known to be a graded response, which occurred when pressure within the head exceeded systolic blood pressure. It was suggested by Cushing that this response came from cerebral ischemia, but it was never proven where the receptive areas for this response were located. We hypothesized that the response was derived from structures in the brainstem or spinal cord or both. As the experiment unfolded, we came to realize that the response was triggered from highly restricted regions within the brainstem and the spinal cord. We mapped those vasomotor receptive areas (Hoff and Reis, 1970).

With Don's gentle guidance, we developed a hypothesis and methodology that was ideal for a research novice. I did not know at the time how masterful that mentoring was. This was a simple experiment, surgically oriented, involving acute studies in anesthetized animals. Don estimated that 6 months would be enough time for completion of the project and it was probable that a paper would be derived from it.

Dr Reis was a "hands-on" mentor from the beginning. He taught me how to anesthetize a cat, fix its head in the Kopf frame, insert cut-downs, do a tracheostomy, and monitor blood pressure, intracranial pressure, and heart rate on a strip chart recorder. After a number of failures initially, he reminded me that even in the best of circumstances, our experimental design would probably result in one success from every three experiments in which all the data sets we sought were complete.

Experiments were done 3 days a week, with each one lasting an entire day. Calculating the data consumed the remainder of each week. As the project unfolded, it was obvious that we were onto a hypothesis that could be proven, but modifications in our protocol would be necessary as the data came in. Hence, localization of the Cushing response to the brainstem was achieved. Then we focused on structures within the brainstem itself. A force-displacement strain gauge allowed quantitation of responses to pressure on the pial surface of brainstem and spinal cord (Fig. 1(a)). It was then possible to construct a pressure–response curve (Fig. 2). Responses for comparison with Cushing's original reflex were obtained from a supratentorial, subdural saline injection to elevate intracranial pressure (Fig. 1(b)).

Don showed me how to write the *Methods* section of our paper while we were doing the experiments. I began to accumulate good illustrations from the strip chart recordings (Fig. 3). Statistics and data analysis became more and more important when experiments began to accumulate. Soon we had several, and then many. Illustrations of the Cushing response, bar graphs, photographs of our equipment, and line drawings with legends for each followed. The last step of the experiment was final calculation of our results, which was simply a compilation of all the data sets we had already analyzed (Fig. 4).

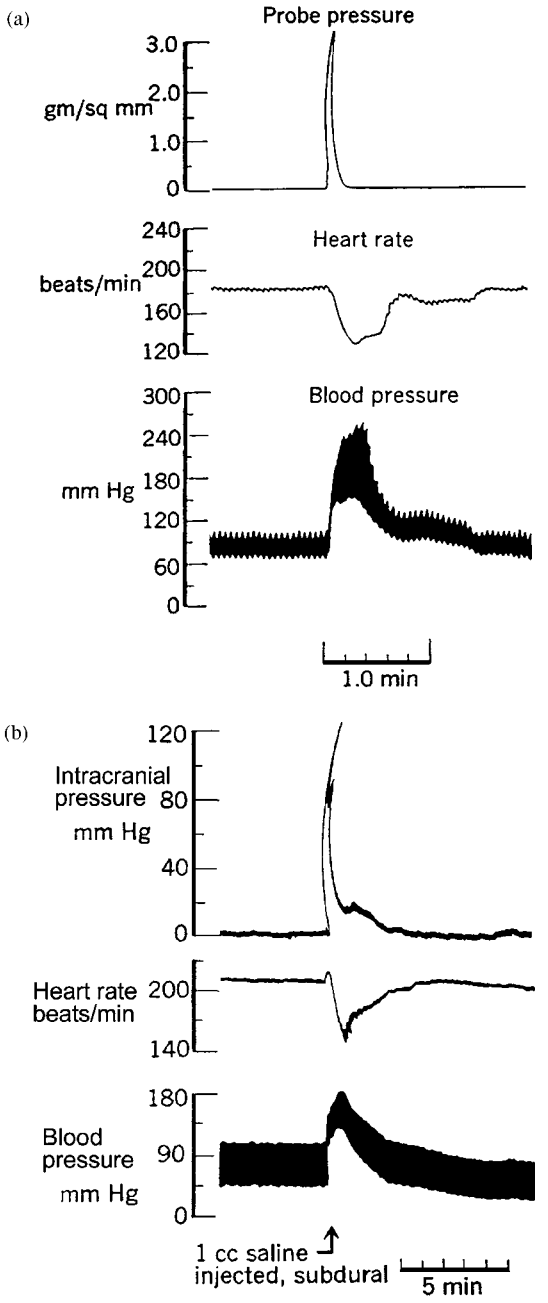


**Fig. 1.** (a) Cushing response elicited by compression of pial surface, dorsal brainstem. Stainless steel probe of 1.5-mm tip diameter was attached to a force-displacement transducer mounted on a stereotaxic electrode carrier. (From Hoff and Reis, 1970. Copyrighted 1970, American Medical Association) (b) Cushing response elicited by injection of saline into subdural space, supratentorial. (From Hoff and Reis, 1970. Copyrighted 1970, American Medical Association)

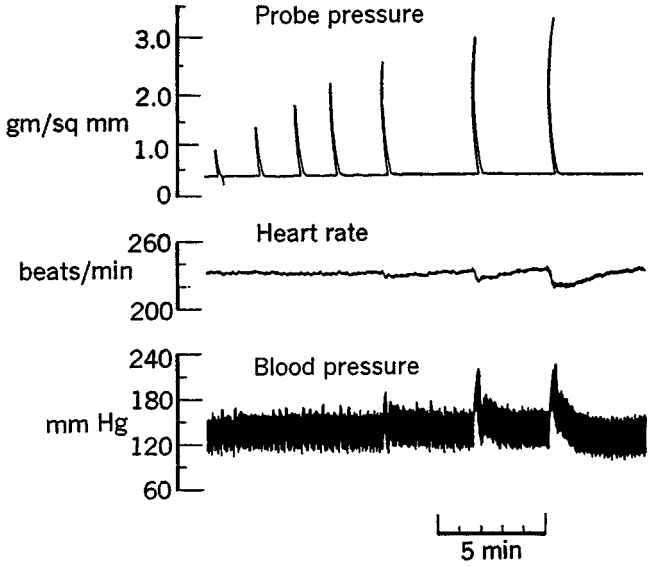


**Fig. 2.** Graded Cushing response elicited by probe pressure on the dorsal surface of the brainstem. (From Hoff and Reis, 1970. Copyrighted 1970, American Medical Association)

Once the *Methods* and *Results* were written, we turned to the *Introduction* and *Discussion*. Extracting an abstract was simply accomplished by pulling a few sentences from each of the sections we had already described. Titling the paper was the result of Don's emphasis on what we actually found and in what species. We polished the paper by rewriting it at least a dozen times. Getting my style of writing into a more readable form was another of Don's great mentoring talents.

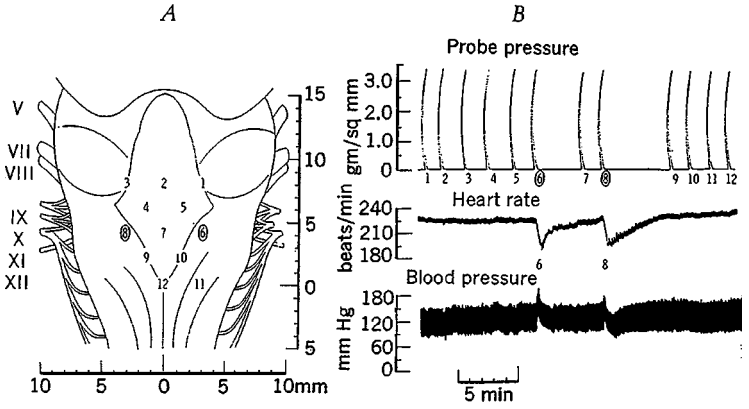


**Fig. 3.** Mapping the dorsal brainstem for areas which elicit a Cushing response. Cerebellum has been removed. Only probe sites 6 and 8 produced the response in this experiment. (From Hoff and Reis, 1970. Copyrighted 1970, American Medical Association)

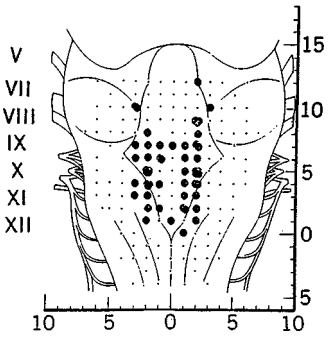


**Fig. 4.** Cushing responses to local pressure on the dorsal surface of the brainstem. Spinal cord intact. Composite of responses from 11 anesthetized, paralyzed cats. (From Hoff and Reis, 1970. Copyrighted 1970, American Medical Association)

Then, where to send the masterpiece? Feeling that a specialty journal would simply bury it, we decided to send the manuscript to a journal that would be read by neuroscientists. We sent the paper off. Within a few months, the *Archives of Neurology* responded with acceptance of the paper without revision. The paper was published some months after my laboratory experience had ended and I had returned to the clinical setting. In the interim, I presented the project to colleagues in New York and received an award for it.

The mentoring that Don Reis provided me changed my career. When I first went into that laboratory, my intent was to return to the Pacific Northwest and practice neurosurgery where I was brought up. That life would not have allowed me the opportunity to do research as well as practice neurosurgery. Instead I chose an academic route, which allowed me the opportunity to do research, teach, and be a clinician. I have followed along that path ever since. I still do research in a well-established laboratory, funded by extramural sources focused on cerebrovascular pathophysiology, brain swelling, and clinical correlates.

Had it not been for the rich experience I had with an outstanding mentor during my formative years, I would never have pursued the career I now have. Don Reis was a research mentor extraordinaire. He helped me during that critical time in my life and thereafter for many years. He continues to influence my life to this day, even though he is gone.

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