Journal of Mammalian Evolution
https://doi.org/10.1007/s10914-019-09479-4

ORIGINAL PAPER

Leonard B. Radinsky (1937–1985), Radical Biologist

Richard F. Kay[1]

Abstract
Trained in vertebrate paleontology, Leonard Radinsky (1937–1985) made signal contributions to the study of form and function in paleobiology. Here, I review Radinsky's contributions and philosophy in the context of developments during the 1960s and 1970s, when a significant number of vertebrate paleontologists departed from their roots in the geological sciences to embrace a new interest in paleobiology and evolution. The study of comparative biomechanics and allometry in extant mammals was brought to the fore, with the express intent of applying the findings to reconstruct the biology of their extinct relatives. Radinsky's contributions lay especially in the area of jaw mechanics in carnivorans and ungulates, and the evolution of the brain in ungulates, carnivorans, and primates. Alongside his important scientific contributions, Radinsky espoused radical views for his time. He fervently believed that basic science cannot be isolated from its social and political context. At a time when the US was deeply engaged in military conflict in Southeast Asia, Radinsky believed that the results of basic science unjustly were being co-opted by corporate and military interests. He believed that science should be used for the betterment of the great majority of the people.

Keywords Paleobiology · Brain evolution · Vertebrate functional morphology · Science for the People · New University Conference · University of Chicago

Introduction

I welcome the opportunity to offer some personal perspectives on Leonard Radinsky, who I knew well professionally, and less well, but memorably, as a person. Radinsky was my senior but we fell easily into conversation when on occasion we had an opportunity to see one another at meetings and elsewhere.

We found common ground on ways to study paleobiology, as articulated by Jim Hopson and Radinsky (1980:252):

> "Many of the inferences which are made about the biological role of fossil morphology in the life of the once living animal are based on intuition or 'common sense'. Since the behaviors in question can no longer be observed directly, the only way to strengthen, or make more robust, such hypotheses (which never can be tested directly) is to examine the strength of empirically-derived correlations of form and function in living species."

Also, we agreed that paleontologists should be encouraged to undertake experimental studies on living species (although he did not do so himself) with the rationale that an improved understanding of the relation of form to function in living animals will aid in the functional interpretation of extinct ones for which only the form is available. Radinsky's research can be summarized as vertebrate paleontology with a focus on function. He passed through three phases, each building on the last.

Scientific Contributions

1) Perissodactyl evolution (1962–1967).

Radinsky's early work centered on the study of the evolution of the Order Perissodactyla. It began with his dissertation project on Eocene tapiroids in the Department of Geology at Yale University under the direction of Joseph Tracy Gregory (1914–2007). After Gregory's departure from Yale in 1960 to

✉ Richard F. Kay
rfkay@duke.edu

[1] Department of Evolutionary Anthropology, Duke University, Durham, NC 27708, USA

Published online: 15 August 2019

become chairman of the Department of Paleontology, and a curator in the University of California Museum of Paleontology, Radinsky finished his study (1962) under Elwyn Simons, who had taken up the mammalian paleontology position at Yale. Following completion of his dissertation, Radinsky moved on to a postdoctoral fellowship at the American Museum of Natural History where he continued his studies of Tertiary perissodactyls.

Even in his earliest work he expressed interest in functional and adaptive explanations for the evolutionary changes he observed (Radinsky 1969a). He was especially interested in instances of parallel evolution, which in perissodactyls included molarization of the premolars and increases in the shearing crests and grinding mechanisms of the cheek teeth. He noted widespread parallelism in the evolution of the perissodactyl foot skeleton leading to digitigrady, involving the loss of the paraxial metacarpals, and lengthening and strengthening of the central metapodial, which he interpreted as a trend toward more cursorial locomotion. Also, he documented parallel changes in the shape and size of perissodactyl brains. More broadly, he compared perissodactyl faunas on different continents during the Eocene and Oligocene. Such observations led him to propose that competition for food resources with contemporaneous artiodactyls led to a decline in the overall diversity of perissodactyl families and genera in the Oligocene and a concordant increase in artiodactyl taxa with selenodont teeth.

It is perhaps his observations about repeated instances of parallelism among closely related forms and the dense fossil record of the North American early Eocene that led him to contribute to some of the important intellectual trends in vertebrate paleontology at that time, but to downplay others.

The rise of cladistics in the 1960s and its application to vertebrate paleontology was centered intellectually at the American Museum of Natural History during Radinsky's time there, as was the tendency of some to emphasize rapid and punctuated events in evolutionary time (Eldredge and Gould 1972). Neither of these approaches appears to have appealed to Radinsky. As Hopson (1989:9) noted, Radinsky had an "admirable awareness of the complexity of the patterns of distribution of morphological features…. [Likewise] he never fully accepted cladistics as a philosophy of systematics because, in his experience with… Cenozoic mammals, it tended to yield overly simple patterns of relationship based on overly clear-cut distributions of characters."

2) Studies of brain evolution (1967–1979).

Radinsky became fascinated by the apparent 'progressive' brain evolution in perissodactyls which, in turn, sparked a broader interest in mammalian brain evolution. He had noted in 1969 that many of the observed changes in brain size in perissodactyls were related to increases in the body mass and wondered about the extent to which brain evolution was driven solely by allometric factors—changes in brain size as a function of changes in body size. To characterize the brain-body relationship, Radinsky was an early adopter of allometry in the study of brain evolution. In this, perhaps he was influenced by Stephen Jay Gould. Gould was a graduate student at Columbia University and AMNH between 1962 and 1967. Gould's (1966) paper, "Allometry and size in ontogeny and phylogeny," published while Gould was still a graduate student, seems to have had a significant influence on Radinsky's thinking, for he made allometry a central tool in his research from that time onwards. Another influence was Harry Jerison's book *The Evolution of the Brain and Intelligence* (1973). To account for the well-known phenomenon that increases in brain size do not keep pace with increases in body size (negative allometry), Jerison proposed an "Encephalization Quotient" or EQ, to use as an allometric body-size correction for relative brain size.[1]

Jerison (1973) proposed an explanation for the well-known evolutionary phenomenon that EQ in mammals increases through geologic time. He suggested that there had been an evolutionary 'arms race' between herbivorous ungulates and their carnivorous predators, with the 'average' carnivoran predators always having larger EQs than their 'average' contemporary ungulate prey, with the EQ of both groups increasing in lock step through geologic time. So, in concept, you have to be 'smarter' to be a jaguar than to be a pronghorn.

Radinsky (1978) accepted Jerison's EQ as a means to compare relative brain sizes in living and extinct mammals but identified flaws in underlying data upon which Jerison's 'arms race' concept was based. He much more carefully compiled data on brain size and body size for North American Cenozoic ungulates and carnivorans. And, because the brains of ungulates and carnivorans show overall trends towards an increase in endocranial volume through time (at least in the Paleogene), he noted that more precise geologic age information is required (as opposed to just 'binning' all the Paleogene ungulates and carnivorans together, as Jerison had done). With the refined dataset, it turned out that the supposed larger brained carnivorans were geologically younger than the bulk of the ungulate taxa, so the relative size disparity between small-brained ungulates and larger-brained

[1] The Encephalization Quotient is a ratio of the observed brain size of any species (E_i) divided by the 'expected' brain size derived from an empirically derived least-squares fit between brain size and body size in living mammals. Thus, $E_i = E_i / 0.12P_i^{0.67}$ where E is endocranial volume in cubic centimeters, and P is body mass in grams.

carnivorans was a function of disparity in the geological ages of the samples, not, as Jerison supposed, a progressive tit-for-tat coevolutionary pattern.

Jerison (1973) had further proposed an independent test of his arms race hypothesis using South American native ungulates—Notoungulata and Litopterna. Because these SA 'native' herbivores were subject only to predation by small-brained 'archaic marsupial carnivores', Jerison claimed, the SA herbivores were not pushed so hard and had smaller brains than their northern continent vicars. Radinsky (1981a) much more carefully compiled these data for notoungulates and litopterns and showed that SA ungulates exhibited a similar temporal trend through the Cenozoic towards increased brain size as did northern continent ungulates and that by the early Miocene had attained relative brain sizes similar to those of contemporaneous northern ungulates, disproving Jerison's hypothesis.

Radinsky consistently favored functional and adaptive schemes to explain brain evolution. He took the view that the relative sizes of component brain parts and the corresponding surfaces of their endocasts could inform about the evolution of behavior. His work was informed by contemporary research of W. I. Welker and colleagues (Welker and Seidenstein 1959; Welker and Campos 1963) who used physiological experiments to investigate the significance of sulci in somatic sensory cerebral cortex of racoons. He called attention to these differences as inferred from carnivoran brain endocasts. For example, he noted a disproportionate enlargement of several areas of the primary somatic sensory cortex in extant aquatic otters associated with the face and hands (Radinsky 1968a). He linked these findings with the behavior of living otters, suggesting two factors that may be responsible: 1) aquatic environments reduce the effectiveness of vision, and otters may compensate for underwater visual loss by increasing sensitivity of facial vibrissae; 2) enlargement of forelimb sensory projection areas in clawless otters that feed mainly on crustaceans and mollusks rather than on the fish as do other otters, and probably use their hands for feeling around in mud and under rocks to locate food. He drew similarities with the condition found in raccoons that engage in food 'washing' and have enlarged projection areas for individual digits or palmar pads.

In another paper, he cited the work of neurophysiologist C. N. Woolsey on the sensory and motor representations of the cerebral cortex (Woolsey 1958, 1960) to interpret the relatively larger prefrontal cortex in canid endocasts compared with felids as being associated with more highly developed canid social behavior and suggested that the enlargement may have been a prerequisite for the development of the pack social structure of wolves and other canid species. Also, he mentions that the relatively larger olfactory bulbs of canids suggests "an early specialization for a more sophisticated sense of smell in canids than in felids" (Radinsky 1969b:287).

His work on primate brain size and proportions was informed by contemporary work of Stephan, Bauchot, and colleagues (Stephan and Andy 1969; Stephan et al. 1970) who compiled data on relative sizes of brain components of living mammals. In primates, he noted that an expanded visual cortex and a reduced size of the olfactory bulbs, especially in anthropoids, were as notable as overall changes in relative brain size (Radinsky 1975).

A technical component of Radinsky's studies of brain evolution was his development of a method for obtaining faithful replicas of the interior of the mammalian braincase by pouring latex into dried skulls and then extracting the solidified latex inside-out through the foramen magnum (Radinsky 1968b). His collection of latex endocasts were central to his studies of brain evolution. Before the advent of high-resolution CT technology, this was the only practical way to undertake broad comparative study of brain shape. Radinsky's collection of brain endocasts is preserved at the Field Museum (Chicago).

3) Functional cranial evolution in ungulates and carnivorans (1980–1985).

By 1980, Radinsky, with his University of Chicago colleague James Hopson, had developed a synthetic view, a new vertebrate paleontology, in which they argued for the centrality of combining the study of living species as a key to understanding the past. In this view, any biological interpretation of vertebrate fossils must combine studies of functional morphology in living species, biomechanical and allometric modelling, and a rigorous evaluation of empirical correlations between form and function (Hopson and Radinsky 1980). In a series of classic papers (Emerson and Radinsky 1980; Radinsky 1981b, 1982, 1983, 1984, 1985) he undertook a functionally-based comparative study of the evolution of carnivoran and ungulate cranial evolution. His approach used several functional morphology perspectives including: the analysis of functional components, skull architecture, jaw biomechanics, and allometry. More specifically, his approach combined analysis of several functional components (neurocranial and splanchnocranial units); skull architecture (framed structures, stress trajectories from trabeculae, and suture morphology); jaw mechanics (lever system analysis); allometry (the effects of size differences on skull shape); and the comparative approach (reconstruction of primitive morphology to highlight by comparison important changes). Enduring insights have come from Radinsky's studies of cranial evolution (see, for example the work of his students Walter Greaves and Sue Herring (Greaves 1978; Herring et al. 1996; Herring and Teng 2000)).

4) The Evolution of Vertebrate Design (1987).

The culmination of Radinsky's professional career came posthumously with the publication of his book *The Evolution of Vertebrate Design* (Radinsky 1987). The book was written as an outgrowth of his course on vertebrate morphology, paleontology, and evolution for undergraduates not majoring in biology at the University of Chicago. His intent was to provide students with an appreciation of the evolution of vertebrates through an understanding of how their body form or design changed through evolutionary time. The book was in manuscript at the time of his death and was brought to publication by his wife Sharon B. Emerson.

Radical Activities and Tenure Struggles

When Radinsky came to University of Chicago's Department of Anatomy in 1967, Professor Ronald Singer was chair. Singer and his family had immigrated to the United States from South Africa in 1962, in large part because his and his wife's active opposition to the policies of apartheid had made life in South Africa untenable (Dechow 2006). Early in 1974, I was offered a job in the Anatomy Department, at which time I met Singer, Radinsky, Charles Oxnard, James Hopson, and other prominent members of the department. I recollect Singer as a gruff, no nonsense dominant personality who smoked cigars in his office and subscribed to a strict academic hierarchy. Singer would have considered himself a liberal in the context of South Africa having left his post in that country on account of his political views. But in Chicago he was outflanked on the left by the Marxist-Leninist groups where Radinsky found a home, groups that espoused radical opposition to the scientific establishment, especially its relationship to the Vietnam war and the military-industrial complex. This was something that Singer could not understand or countenance.

According to students and colleagues who were there at the time, the political situation in the department, as in the rest of the university, was dreadful. There were two camps. One was the conservative, or traditionalist, wing which included Singer and Charles Oxnard, a senior professor. At the other extreme was Leonard Radinsky, with other junior faculty somewhere between, though more sympathetic to Radinsky. One of these was Leigh Van Valen, who was much opposed to Singer and Oxnard, but for more personal reasons bearing on what he perceived to be unfair treatment rather than on politics. The two groups were much in conflict. Van Valen was known for his broadsides against the "Singer-Oxnard Axis," and others posted political "manifestoes" on the department bulletin board that their opponents would tear down and stomp upon. The biggest and most heated political conflicts centered on the conduct of the United States in relation to the war in Vietnam. Radinsky often wore a green military-style coat with a red fist painted on its back, which must have infuriated the senior faculty.

As I have said, the political views of Singer and other senior departmental faculty stood in sharp contrast to the leftist activism of Radinsky. Other junior faculty members, including primatologists Russell Tuttle and Jack Stern and paleontologist Jim Hopson, were somewhere in the middle politically, opposing the Vietnam War but not sympathetic to Marxist ideology.

Radinsky was a member of the Chicago branch of the New University Conference (NUC). The NUC was a national organization of radical graduate students, staff, and faculty formed to organize, support, and promote leftist movements. NUC members were active in the anti-war movement, women's liberation, black power, labor, third world, and student autonomy movements. Radinsky also belonged to the Chicago chapter of Science for the People (SftP), an organization of scientists who stood against the use of the products of scientific research to support the war effort in Vietnam. A fellow member was evolutionary biologist Richard C. Lewontin (who was then at University of Chicago but soon moved to Harvard).

Radinsky co-organized a disruption of the American Association for the Advancement of Science (AAAS, which they labelled AAA$) meetings in Chicago in December, 1970 where SftP distributed a manifesto called Science for the People, later published in the journal Liberation in 1972 (Zimmerman et al. 1972; Zimmerman 2011; Moore 2013; Schmalzer et al. 2018). SftP activists forced the cancellation of a speech by Nobel-Prize winning Glenn T. Seaborg, chairman of the Atomic Energy Commission, who had worked on the Manhattan Project for the development of the Atomic Bomb. Radical scientists and students presented Dr. Edward Teller, the nuclear physicist who was known colloquially as "the father of the hydrogen bomb," the group's second annual "Dr. Strangelove Award" because it said he has "ceaselessly promoted the rapid development of all feasible systems of nuclear destruction (McGehan 1970: A5)." According to Frederick P. McGehan, a journalist for The Sun, Baltimore, Lewontin denounced Dr. Teller's views, and said scientists should be committed to moral and political values and, if necessary, should go so far as committing sabotage before allowing their work to be misused (McGehan 1970). Radicals also disrupted a symposium on 'Crime, Violence and Social Control' by taking the podium and shouting slogans at the audience through bullhorns. One highlight occurred when the wife of one

of the speakers stabbed a disruptor in the arm with her knitting needle.[2]

The disruptions were denounced in letters to Science Magazine, the official organ of AAAS. This comment is representative:

> "I wonder why the people in charge of scientific meetings have abandoned any sense of responsibility to those who attend sessions because they are interested in the subject matter. Granted, there are many chronological and mental adolescents who need to bolster their ego by obscenely and disruptively intruding upon innocent bystanders. But have the innocent bystanders no rights? Must a large number of people be frustrated in their desire to hear a symposium, or an address by the president-elect of their association, because a small number of people prefer their own televised histrionics?" (Suedfeld 1971:230).

Philip Abelson, editor of Science, denounced the disruptions in an editorial (Abelson 1971), as did others (Conrad et al. 1971).[3] In reply, in 1971 Radinsky co-authored a letter to Science justifying disruption of the AAAS (Ivano et al. 1971), giving their affiliation as Science for the People, Department of Anatomy, University of Chicago, which must have further infuriated Singer and colleagues. Radinsky and others defended their tactics at the meeting:

> "We attended the Chicago meeting to promote and provoke discussion about ideas and an analysis of science that are systematically excluded or ignored by the established scientific community. None of the four pieces in the 22 January issue dealt with our ideas. Instead they consisted of name-calling attacks on our methods ("Nazi stormtroopers," "make-believe radicals," and "self-styled scientists"). …People do not engage in disruptive tactics in order to have their ideas heard unless those ideas are denied access to the usual platforms of expression. … it was only in sessions that we opened up, such as one of the violence symposia, that anyone in the audience could express his ideas. We refer to the AAA$ as such not because we find it a rich organization, as Abelson assumed, but rather because it represents the American scientific establishment, which currently mainly serves the interests of the rich and powerful," (Ivano et al. 1971:1198).

They submitted the manifesto to Science for publication but it was rejected by Abelson.

The AAAS incidents also gained widespread attention, and widespread condemnation, in the national press (NY Times, Washington Post, Chicago Tribune, and Los Angeles Times). An editorial in the Post January 1, 1971 stated:

> "This verbal violence reached a kind of culmination at the convention on Tuesday when the wife of a professor who had come to hear some sort of discussion was outraged to the point of jabbing a knitting needle into the arm of a young shouter. She shouldn't have done it, of course. She was entirely out of order. It was altogether unseemly. And we are sorry it happened, although not, perhaps quite as sorry as we ought to be. We can't help wondering if any other argument would have brought home to the scientific shouter quite so clearly the point that force begets force, that violence is the inevitable offspring of irrationality." (p. A18).

The same approach was taken by SftP the next year at the Philadelphia meetings of AAAS at which radical scientists pelted Senator Hubert H Humphrey with a ripe tomato and paper gliders made from Vietcong flags as the Minnesota Democrat, a former vice-president and unsuccessful Democratic candidate for the presidency of the US in 1968 was trying to give a speech. Humphrey was heckled continuously during his talk. Radical scientists hung handwritten

[2] The stabbing gained national attention and international news coverage. This account is condensed from January 30, 1970 issues the Washington Post, Baltimore Sun, The Democrat and Chronicle (Rochester New York), and Chicago Tribune.

The session was held on December 29, 1970. As related in newspapers, a 'radical group' called Science for the People disrupted what they called 'the pig session'. They complained about the 'elitism' of the panel and said that it ignored 'political violence' such as the war in Vietnam and 'police repression'. "You can't separate the violence of the criminal from the violence of society," one shouted during the panel discussion.

Frank Rosenthal, a 26-year-old physics graduate student at Columbia University, was among those who repeatedly heckled speakers in the session. In the midst of a presentation by John Conrad of the National Institute for Law Enforcement and Criminal Justice, audience member Mrs. Jane Hardin, 50, in town with her husband Garrett Hardin, a biologist from the University of California, Santa Barbara, "moved stealthily across the room to a chair behind Rosenthal." Hardin jabbed a knitting needle into Rosenthal's left arm, drawing blood. Rosenthal yelped and grabbed at Mrs. Harden. Another woman took off her shoes and raise them in a threatening gesture toward Mr. Rosenthal. A man who had just seen part of the action, shouted at Rosenthal, "you just hit this woman, you creep." Members of the audience applauded.

Interviewed afterwards, Mrs. Hardin said, "I don't have as loud a voice as he has," as she resumed knitting a sleeve of a sweater, a Mona Lisa smile on her face. "I've lost count of the meetings I've seen stopped by radical types who refused to let people speak," she said. "I'm all for constructive change, but today all I heard was the usual radical clichés and obscenities.... It was your usual gathering of radical types, spoiled children types." Mrs. Hardin said Rosenthal's wound "wasn't serious… Just a scratch. In fact, if he had been a small child, I would have told him to stop crying so I could kiss it (the wound) and make it well."

That afternoon, a group of the demonstrators, described as a "band of a half dozen long-haired students" took over the afternoon session–joining the panel, heckling speakers, controlling the microphone and lights and screening two film shows at once. They passed the hat in support of the Chicago chapter of the Black Panther Health Clinic and Legal Defense Fund. They scribbled slogans on the blackboard such as: "Nixon Has Bad Genes," "Violence Is American As Cherry Pie," and "Kill a Commie for Christ."

[3] "There is no more idealism here than there was in the Hitler Brownshirts for there was or is in the members of the Ku Klux Klan. Fascistic behavior is still that, no matter what the goals claimed happened to be." (Conrad et al. 1971:230).

signs on the podium and behind the stage with slogans such as, “Humphrey wanted for murder, rape, genocide” and “Humphrey lies, Humphrey kills, Humphrey pimps for U.S. imperialism.” (Washington Post, December 28, 1971).

Unknown to the participants at the time, the Federal Bureau of Investigation (FBI) had taken an interest in SftP’s radical’s activities. The FBI files I have seen are largely a compilation of public newspaper articles, but also include information about members of NUC who travelled to Cuba at the invitation of the University of Havana. One quoted the January 10, 1971 newsletter of the NUC by Radinsky and Mel Rothenberg which read (in part) as follows (FBI 1971):

> "AAA$ 1970" by Len Radinsky and Mel Rothenberg
>
> "Under the banner of "Science for the People", radical scientific workers opened up several sections of the American Association for the Advancement of $cience meeting in Chicago over Christmas, to destroy once and for all the myth that American science serves the people. Operating out of a headquarters room on the fifth floor of the Conrad Hilton, they distributed literature…, sold buttons and magazines to the 5000 scientists in attendance, held radical workshops, showed newsreel movies, and confronted various pig symposia with a series of tactics ranging from leaflets to visual and verbal heckling to outright takeovers. Two main political points were made. First, even ‘pure’ science cannot be isolated from the social-political context in which it is done. Only the ruling class in the U. S. today has the resources to utilize the results of science, which consequently serves to promote corporate-military interest rather than those of the great majority of the people. Second, that there exists a growing group of scientific workers interested in integrating their training and skills with people engaged in struggles for liberation. This requires analysis within each field of how scientists committed to struggle can contribute to a true science for the people….”
>
> "Reactions of the audiences we confronted generally exhibited the bankruptcy of contemporary liberalism. Beginning with the seizure of the microphone at the opening address of the convention, when Bill Zimmerman from the New University Conference Peoples Science Collective, gave a militant anti-capitalist rap on people's science, through the several workshops we offered, and sections we took over, the predominantly liberal audience was unable to seriously challenge our critique of U. S. Science as servant of corporate capitalism. Our attractiveness to the liberals carried with it disadvantages, as for example when 100 people came to a workshop on teaching radical ecology and it was not possible to have a good discussion rise above liberal confusion….”
>
> “It turned out to be surprisingly easy to get our message across, probably for several reasons: the meetings were generally dull and we were the only group there with spirit–this gave us extensive press coverage and from 150-200 people each night at our open meetings; our disruptions had serious political content and raised questions liberals are sensitive to and unable to grapple with…; There was no effective ideological opposition; and the AAA$ managers decided not to use the pigs….”

Against the background of his productive scientific research and his radical activity, Radinsky came up for tenure in the Anatomy Department. The senior faculty, who were staid and conservative, initially voted to refuse Radinsky tenure on the grounds that his paleoneurology research using fossil brain endocasts was unreliable. Therefore, Radinsky was initially denied promotion and tenure by the vote of the tenured faculty. However, the junior, untenured, faculty, whose vote was only advisory, advocated for his retention on the basis of his total body of research, including that on perissodactyls. Several senior faculty then changed their votes, and Radinsky was granted tenure. He went on to become Chair of the Department in 1978 and served in that role until 1983. Singer refused to recognize Radinsky as Chair, and would not hand over the departmental keys to him. Singer and the senior faculty also opposed tenure of another noted University of Chicago paleontologist and evolutionary biologist, Leigh Van Valen. Again the junior faculty lobbied for his retention. Later, Van Valen was accepted into the Department of Ecology and Evolution, not Anatomy, and moved his office to Geological Sciences (Callum Ross, personal communication).

Personal Recollections

I conclude with several personal stories from my own interactions with Radinsky. I first became acquainted with Len in 1971 when he visited Yale University where I was in graduate school. He demonstrated his latex endocast method and we struck it off. I saw him again in the spring of 1973 at a conference at Florida State University on the Evolution of the Brain and Behavior in Vertebrates, which became a two volume book (Masterton et al. 1976). In the spring of 1974, he lobbied hard for me to join the faculty at Chicago, and I received a formal offer from Singer. However, I had newly arrived in Durham and in the end preferred to remain at Duke University. I had great respect for his work. His incorporation of allometry in his work was similar to mine. His research on the evolution of the brain in non-human primates

represented an enormous stride forward for primate paleontology.

Len and I shared a professional link, having both been at Yale as Geology Department graduate students. He was at Yale when JT Gregory left and Elwyn Simons became his nominal advisor. Simons was also my advisor. Radinsky was personally uncomfortable with Simons. Simons had since moved from Yale to Duke, so we were colleagues. In the early 1980s, when invited to speak at Duke, Radinsky called me to ask a favor: could he be my house-guest? He freely admitted that the request was partly out of friendliness with me and partly out of fear that Simons might ask him to stay at his home.

Some years later, as Len's cancer spread and shortly before his death, he again visited, to see his son graduate from college. I admired Len's strength and equanimity as he faced death. He said the most difficult thing about being sick was that people tended to avoid him because they found it awkward to discuss such things. He was a wonderful person to have known and I wish I had known him longer and better.

Acknowledgements I thank the organizers of the symposium: El paradigma de correlación forma-función en mastozoología: un tributo a Leonard Radinsky (1937–1985) organized by G.H. Cassini, N. Toledo, and SF Vizcaíno, for the XXXI Jornadas Argentinas de Mastozoologia; La Rioja, Argentina. 25 October, 2018. I especially thank Sigrid Schmalzer, and Kelly Moore for information and insight about Leonard Radinsky's political activities. I had helpful discussions with my former colleague Matt Cartmill, who was a University of Chicago (UC) graduate student in the mid-1960s, and James Hopson and Jack Stern who were Len's UC colleagues. Professor Callum Ross (UC) provided valuable unpublished information from his interviews with other UC contemporaries.

References

Abelson PH (1971) The Chicago meeting. Science 171:239

Conrad JP, Humphreys LG, Suedfeld P (1971) Debacle, disruptions, demagogues. Science 171:230

Dechow PC (2006) In memoriam: Ronald Singer, 1924–2006. Anat Rec 289:114–115

Eldredge N, Gould SJ (1972) Punctuated equilibrium, an alternative to phyletic gradualism. In: Schopf TJM (ed) Models in Palaeobiology. Freedman, Cooper, San Francisco, pp 82–115

Emerson SB, Radinsky LB (1980) Functional analysis of sabertooth cranial morphology. Paleobiology 6:295–312

FBI (1971) Federal Bureau of Investigation File: Chicago, Illinois report on Scientists and Engineers for Social and Political Action 10/14/1971. unpublished, obtained by FOI request

Gould SJ (1966) Allometry and size in ontogeny and phylogeny. Biol Rev 41:587–638

Greaves WS (1978) The jaw lever system in ungulates: a new model. J Zool 184:271–285

Herring SW, Teng S (2000) Strain in the braincase and its sutures during function. Am J Phys Anthropol 112:575–593

Herring SW, Teng S, Huang X, Mucci RJ, Freeman J (1996) Patterns of bone strain in the zygomatic arch. Anat Rec 246:446–457

Hopson JA (1989) Leonard Burton Radinsky (1937-1985). In: Prothero DR, Schoch, RM (eds) The Evolution of Perissodactyls. Oxford University Press, New York, pp 3–12

Hopson JA, Radinsky LB (1980) Vertebrate paleontology: new approaches and new insights. Paleobiology 6:250–270

Ivano B, Radinsky LB, Rothenberg M (1971) Rebuttal to previous editorial positions. Science 171:1198

Jerison HJ (1973) Evolution of the Brain and Intelligence. Academic Press, New York

Masterton RB, Campbell CBG, Bitterman ME, Hotton N, eds (1976) Evolution of the Brain and Behavior in Vertebrates. Lawrence Erlbaum Associates, Hillsdale, New Jersey

McGehan FP (1970) Father of H-bomb gets Dr. Strangelove Award, radical scientists mock teller at Chicago convention. The Sun, Baltimore, December 28, 1970, p A5

Moore K (2013) Disrupting Science. Social Movements, American Scientists, and the Politics of the Military, 1945–1975. Princeton University Press, Princeton

Radinsky L (1975) Primate brain evolution. Am Sci 63:656–663

Radinsky LB (1968a) Evolution of somatic sensory specialization in otter brains. J Comp Neurol 134:495–505

Radinsky LB (1968b) A new approach to mammalian cranial analysis, illustrated by examples of prosimian primates. J Morph 124:167–179

Radinsky LB (1969a) The early evolution of the Perissodactyla. Evolution 23:308–328

Radinsky LB (1969b) Outlines of canid and felid brain evolution. Ann N Y Acad Sci 167:277–288

Radinsky LB (1978) Evolution of brain size in carnivores and ungulates. Am Nat 112:815–831

Radinsky LB (1981a) Brain evolution in extinct South American ungulates. Brain Behav Evol 18:169–187

Radinsky LB (1981b) Evolution of skull shape in carnivores, 1. Representative modern carnivores. Biol J Linn Soc 15:369–388

Radinsky LB (1982) Evolution of skull shape in carnivores. 3. The origin and early radiation of the modern carnivore families. Paleobiology 8:177–195

Radinsky LB (1983) Allometry and reorganization in horse skull proportions. Science 221:1189–1191

Radinsky LB (1984) Ontogeny and phylogeny in horse skull evolution. Evolution 38:1–15

Radinsky LB (1985) Patterns in the evolution of ungulate jaw shape. Am Zool 25:303–314

Radinsky LB (1987) The Evolution of Vertebrate Design. University of Chicago Press, Chicago

Schmalzer S, Chard DS, Botelho A (2018) Science for the People. Documents from America's Movement of Radical Scientists. University of Massachusetts Press, Amherst and Boston

Stephan H, Andy OJ (1969) Quantitative comparative neuroanatomy of primates: an attempt at a phylogenetic interpretation. Ann N Y Acad Sci 167:370–387

Stephan H, Bauchot R, Andy OJ (1970) Data on size of the brain and or various brain parts in insectivores and primates. In: Noback CR, Montagna W (eds) The Primate Brain. Appleton Century Crofts, New York, pp 289–297

Suedfeld P (1971) Debacle, disruptions, demagogues. Science 171:230

Welker W, Campos G (1963) Physiological significance of sulci in somatic sensory cerebral cortex in mammals of the family Procyonidae. J Comp Neurol 120:19–36

Welker W, Seidenstein S (1959) Somatic sensory representation in the cerebral cortex of the racoon (*Procyon lotor*). J Comp Neurol 111:469–501

Woolsey CN (1958) Organization of somatic, sensory, and motor areas of the cerebral cortex. In: Harlow HF, Woolsey CN (eds) Biological and Biochemical Bases of Behaviour. University of Wisconsin Press, Madison, pp 63–81

Woolsey CN (1960) Organization of cortical auditory system: a review and a synthesis. In: Rasmussen, GL, Windle, WF (eds) Neural Mechanisms of the Auditory and Vestibular Systems. Charles C. Thomas, Springfield, pp 165–180

Zimmerman B (2011) Troublemaker: A Memoir from the Front Lines of the Sixties. Anchor Books, New York

Zimmerman B, Radinsky LB, Rothenberg M, Bart M (1972) Towards a Science for the People. People's Press (downloaded from: https://www.ocf.berkeley.edu/%7Eschwrtz/SftP/Towards.html, Brookline, MA