I have not forgotten my first day at MIT. In 1950 Moore instructors had to teach summer school. On a sunny afternoon early in July, I crossed the bridge in search of Building 2. Math headquarters was on the second floor; it still is. I introduced myself to Ruth Goodwin, who handled all secretarial services, and I asked to see the chairman. When I gave Ruth my name, a chap sitting across from her, head buried in the *Boston Globe*, lowered his paper and said: “Singer, I’m Ambrose. There is a seminar in Lie groups in five minutes. You can see Martin later. Come.”

I did, and met John Moore, Barrett O’Neill, and George Whitehead, who became lifelong friends. After getting my teaching assignment from Ted Martin, Ambrose told me the seminar met at midnight in the Hayes-Bickford coffee shop. He would pick me up at 11:45. Kay Whitehead joined us for these evening sessions; the coffee was deadly, the conversation lively. Ambrose gave me a tour of Boston that first night and by the time he dropped me off, we were close friends.

One day Ambrose said, “Singer, you listened to Chern’s lectures. What did he say?” At Chicago, I had passively taken notes of S. S. Chern’s course, while writing a dissertation in another subject. What with interpreting my notes, reading Chern’s papers, pouring over Elie Cartan, and Ambrose insisting on absolute clarity in every detail, we learned differential geometry together.

Ambrose designed the Geometry of Manifolds course, and we taught it in alternate years. It is pretty much the same today as it was then: standard manifold theory the first term and instructor’s choice of topics the second. Our students wrote some well-known graduate texts based on this course: Bishop-Crittenden, Hicks, and Warner.

With customary zeal, Ambrose changed the undergraduate program in pure mathematics. Whereas in 1948 Andre Weil explained differential forms to the faculty at the University of Chicago, less than a decade later we were using them in undergraduate differential geometry. Ambrose taught the Lebesgue integral in the analysis course for juniors and seniors “because it’s simpler than the Riemann integral.” For almost twenty years Ambrose was the guiding spirit of pure mathematics at MIT. His efforts were key in making it a great department.

Ambrose and I regularly drove around Boston late at night talking about mathematics and life. We knew every street; and to this day, with the inevitable traffic jam, I’ll remember an alternate route and, often enough, a special moment: yes, here is where we finally understood holonomy.

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Ambrose taught me jazz. I had been an enthusiast of Dixieland and swing. But by 1950 bop was dominant. Charlie Parker was king, and everyone else his student. We heard all the great jazz musicians at all the jazz joints. There was a casualness and directness then that makes it difficult for me to hear jazz live today. It’s too rigid and formal now. Imagine watching Bird take on a long line of young sax players, listening to each intently and then playing their variation as it should be played. Teaching at its best, I felt. Imagine having coffee between sets with Billie and thanking her for her early records that meant so much to many of us. Dick Kadison and I used to hear Ella night after night at Birdland when we took a break from work. Ambrose explained jazz to me and talked about it in the fifties the way Wynton Marsalis does now.

Though mathematics was wonderful, I was heavily burdened. My oldest son was blinded at birth and, as I learned later, brain damaged. I could not have survived as a mathematician without Ambrose’s steady support and the steady support of my very good friend, Dick Kadison. Those who knew Ambrose know that expressing gratitude was forbidden. He walked rapidly away the one time I tried. Occasionally, I can provide special help to a young mathematician. I think of Ambrose and feel that by the time I have helped a hundred, I’ll have begun to pay my debt to him.

I loved Ambrose for his absolute honesty, his generosity, his wit, his energy, and above all for his tenderness, which he tried so hard to hide. I am sad that so few mathematicians knew what a great man he was. But I was happy for him when he found his wife, Jeannette, with whom he could be himself for twenty years.

I. M. Singer

Warren Ambrose, a pioneer in differential geometry, passed away on December 4, 1995, in Paris. He was eight-one.

Differential geometry has not always been the popular subject that it is today. In the 1950s Ambrose (together with I. M. Singer) made MIT into the only center in geometry in the United States outside of the University of Chicago.

Ambrose was born on October 25, 1914. He obtained his Ph.D. in probability with J. L. Doob at the University of Illinois at Urbana (now Urbana-Champaign) in 1939, but his interest soon switched to functional analysis. His most notable work in the former area is probably his structure theorem of what he called the $H^*$-algebras, a generalization of the $L^2$ group algebra of a compact group (Trans. Amer. Math. Soc. 57 (1945), 364–386). By the early 1950s his interest had changed yet again, this time to differential geometry. In his later years, he was to explain this change by saying that he wanted to be in a field where “the theorems come less easily”.

Ambrose entered geometry at a time when the dawn of a new era was just around the corner. The works of J. L. Synge, H. Hopf, and S. Cohn-Vossen in the decade after 1925 and those of S. B. Myers and S. S. Chern in the forties made the shift of focus in geometry from the local to the global all but inevitable. Then in 1950 C. Ehresmann published a paper that cleaned up the foundations; availing himself of the latest works in Lie theory and topology, he gave the first rigorous definition of a connection on a fiber bundle. The stage was thus set for a nontrivial theorem that would embrace this new spirit and new machinery. It can be argued that the Ambrose-Singer holonomy theorem (Trans. Amer. Math. Soc. 75 (1953), 428–443) was exactly that theorem. This theorem concerns a principal $G$-bundle $P$ with connection $C$ over a connected manifold $M$, where $G$ is a Lie group. The connection $C$ associates to each curve $y$ on $M$ joining two points $x$ and $y$ an isomorphism $\gamma_\ast$ from the fiber $P_x$ over $x$ to the fiber $P_y$, called the parallel translation from $x$ to $y$. (If $P$ is the bundle of bases in the tangent spaces of $M$ so that $G$ is the general linear group $Gl(n, \mathbb{R})$, then $\gamma_\ast$ is the parallel translation in the classical sense, i.e., it maps the bases in $M_x$ (tangent space at $x$) to those in $M_y$.) Now fix an $x$ in $M$ and consider all the loops that begin and end at $x$. $\gamma_\ast$ then becomes an automorphism of $P_x$ which turns out to coincide with the action of an element $\tilde{y}$ of $G$ on $P_x$. The set of all such $\tilde{y}$ as $y$ runs through all the loops at $x$ is easily seen to be a subgroup
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