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The education of Jean André Ville

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Abstract

Jean André Ville (1910–1989), who brought the concept of a martingale into the mathematical theory of probability, is relatively little known. This article recounts circumstances and events of the first three decades of his life, from his birth in Marseille on June 24, 1910, to his defense of a doctoral thesis in 1939, on the eve of World War II. Additional information about his life and work is provided in other articles and documents in this issue of the *Electronic Journal for History of Probability and Statistics*.

1 Introduction

The French mathematician Jean André Ville was born in Marseille on June 24, 1910, and died at the age of 78 in the Loire Valley, where he had retired after his career in Paris, on January 20, 1989.

Ville was one of the inventors of the concept of a martingale, which has become increasingly central in mathematical probability. His way of understanding martingales makes him the inventor as well of game-theoretic probability, which has occupied my energies for nearly fifteen years [79]. He has also been celebrated for his contributions to signal theory [38], utility theory [47], and the minimax theorem [96]. Yet he remains one of the lesser known of the mathematicians trained at the University of Paris between the

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two world wars. Most of his intellectual contributions were largely forgotten for decades before being rediscovered. He was never elected to the French Academy of Sciences, and little has been written about his life and career.

Why was Ville's work so easily neglected? Was this due to his character? To a string of unfortunate circumstances – what one friend called a curse? To the turbulence of his times? To the lack of interest in applied mathematics in France? To his being too far ahead of his time?

My own fascination with Ville's life and work relates particularly to his discovery of martingales and his quickly turning away from them. How did he come to create something so novel, and why did he subsequently fail to exploit his insights? Puzzled by these questions, I have spent several years studying his life, even visiting his family's home town in the Pyrenees and the house where he died in the Loire valley. I plan to tell what I have learned in a full personal and scientific biography. This is an installment on that biography, an account of his life from his birth up to his thesis, which introduced martingales, in 1939.

Ville did not make his biographer's task easy. Bernard d'Orgeval, a classmate at the Ecole Normale Supérieure, recalled later that Ville was a bit secretive, unusually discreet about his personal life. Georges Th. Guilbaud, who was close to Ville professionally in the 1950s, recalled that there was something mysterious in his everyday behavior. He was warm and friendly, but he never spoke of himself, not of his personal life, not of his past, not even of his professional activities. Some of his students and academic colleagues knew that he and his wife had frequented literary circles in the Montparnasse quarter of Paris for twenty years starting in his student days in the 1930s, and that he had pursued a simultaneous career as an engineer starting in the 1940s. But rumors of these multiple lives only deepened the sense of mystery he seemed to cultivate.

Some of Ville's mysteries will probably endure. He had no children, and he and his wife left behind no relatives with whom they were close. The records of the department at the University of Paris where he worked for the last two decades of his career were largely discarded when the Jussieu campus was vacated to make way for asbestos removal and renovation in the late 1990s. The records of the company where he worked as an engineer, if they still exist, are buried in a mountain of documents dispatched to long-term storage by the multinational Alcatel-Lucent. Most of his personal papers were discarded or destroyed by fire.

But there remain other records and other memories. Many of Ville's students and even a few of his colleagues are still living. The roots of his family were in Mosset, a village in the Pyrenees where memories are long. Bernard d'Orgeval recounted his years at the Ecole Normale in an autobiography written for his children. In Berlin and Montparnasse, Ville spent time with Jean-Paul Sartre and Simone de Beauvoir, who recorded much of their own day-to-day life in letters and journals. The French state still carefully preserves the personnel records of its employees. When all the threads are



Figure 1: Views of Mosset. The view on the left looks up the Castellane valley and towards the mountains to the north. The view on the right looks back down the valley and towards the higher mountains to the south, on the border with Spain.

pulled together, we will find that we know a great deal about Jean André Ville.

2 The school of the third republic

Mosset is in France's Catalan country, the northern slice of Catalonia that was ceded by the King of Aragon to the King of France in 1659. Today the village is part of the French department called the Pyrénées-Orientales (Eastern Pyrenees). The departmental capital, Perpignan, lies on the main road along the Mediterranean. To reach Mosset from Perpignan, you travel west up the Têt River for about 50 kilometers, to the vicinity of Prades, a town of a few thousand people, and then you climb another 15 kilometers, up a valley formed by a tributary called the Castellane. There, about 700 meters above sea level, you find a fortified and gated village of about 300 people, built on a rocky spur around a castle that dates from the 12th century.

In the late 1930s, Prades and Mosset sheltered refugees from the Spanish civil war, and today Mosset is known for the cultural center and artists' colony nearby at La Coûme. But at the beginning of the twentieth century, the inhabitants of Mosset and the other mountain villages around Prades were still mainly farmers and shepherds, speaking the same Catalan and living in much the same way as their ancestors had a hundred years earlier.

Jean André Ville's paternal ancestry can be traced back eight generations in Mosset, to Miguel Vila, a shepherd born in the 17th century. Miguel's grandson Francesch Vile (1735–1805) was already a land-owning farmer. Francesch's great-grandson Julien Ville (1832–1911) was Jean André Ville's grandfather. Ville, still a common name in Mosset, is pronounced with the *l* sounded. The French word *ville* (pronounced in the same way) and the Catalan word *vila* (with the *v* pronounced like a *b*) both derive from the

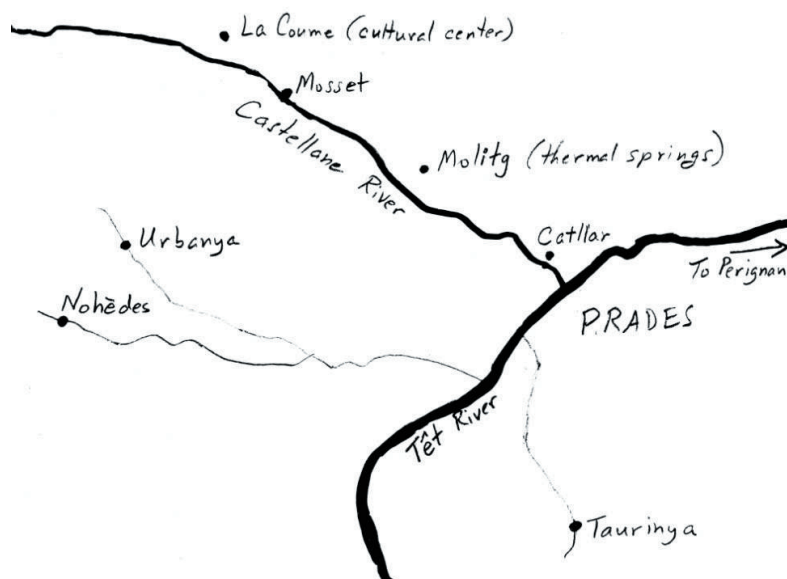


Figure 2: Prades and its vicinity

Latin *villa*, meaning house or farm and, by extension, town or city.²

Julien Ville raised three sons. Pierre and Jean became Mosset farmers like their forbearers. But their older brother, Jean André's father Jean Baptiste, born in 1871, became an employee of the PTT – the branch of the French government responsible for the country's postal, telegraph, and telephone service. Having passed the first of two examinations then required for the baccalaureate, which French students must earn at the end of their secondary education in order to enter the university, Baptiste went to work for the PTT in Montpellier in 1895 as an errand boy. As he worked up in the ranks, he spent time in Paris and Lyon and then five years in the colonies – in Djibouti and then in Vietnam.³ When he returned to France in 1904, to a position in the regional headquarters of the PTT in Marseille, he married Marie Vernet, a daughter of his schoolteacher back in Mosset.

Marie's father André Vernet had been born in Catllar, down the mountain from Mosset near Prades, but he had taught school in Mosset and had settled there to raise five children. Marie was the youngest. She was a schoolteacher, like her two older sisters. Her two older brothers were priests.

When their first child was born, Baptiste and Marie named him André, in his deceased grandfather's memory. He died at the age of 21 months, on

²I am deeply indebted to Jean Parès, distant cousin of Ville and avid genealogist, for information about Ville and his family. Parès published an informative article on Ville in a local publication, the *Journal des Mossétans*, in 2008 [68]. He also provided me with many other results of his research and hosted me on my own visit to Mosset in July 2008.

³The one-page dossier of Baptiste Ville's career as a state employee is preserved in the National Archives in Paris: CARAN F/90/22154.

	Eugénie Vernet 1850–1929 Schoolteacher	
André Vernet 1821–1895 Schoolteacher	Théophile Vernet 1851–1931 Priest	
Marie Estève 1829–1894	Alexandrine Vernet 1856–1931 Schoolteacher	
Married 1849	Benjamin Vernet 1863–1935 Priest	
	Marie Vernet 1876–1955	
	Marie Vernet married Jean Baptiste Ville on April 19, 1904.	André Ville died 1908 Jean André Ville 1910–1989
Julien Ville 1832–1911 Farmer	Jean Baptiste Ville 1871–1927 Telegraph inspector	
Rose Taurinya 1841–??	Pierre Ville 1875–1964 Farmer, 4 children	
Married 1867	Jean Ville 1882–1978 Farmer, 3 children	
	Two other children died in infancy.	

Table 1: Jean André Ville’s family: the brother André who died in infancy, his parents Marie and Jean Baptiste, his aunts and uncles, and his grandparents.

September 25, 1908, and is buried in the cemetery in Mosset. Their second child, our Jean André, was born in Marseille on June 24, 1910. They named him André to honor his brother and his grandfather, and Jean to honor his father's oldest brother, who was also his godfather. He was later known professionally as Jean Ville, but in his family and as a student he was André. In his young adulthood, when his signature was still legible, it was Ville with an "A", not a "J".

Marseille is only half a day's journey from Prades by train, and on holidays André and his parents were often back in Mosset and in Mollitg,⁴ a village halfway down the mountain from Mosset, where his mother's sister Eugénie had taught and then maintained a guesthouse at the thermal springs. His mother's siblings, the priests and schoolteachers, were all childless, but in the summers, André would leave his Aunt Alexandrine's house in Mosset to join his cousins on his father's side in the fields on the mountainside far above the village. During the summer, the farm families lived in barns next to their fieldwork. Eighty years later, when Jean Parès and I talked with André's cousin Marie Argelès,⁵ only a year younger than André, she still remembered his playing with them in the fields. Marie and the other Mosset cousins would talk about events in the village and the farm work; André would talk about his studies and show them medals he had earned for outstanding scholarship.

The story of Baptiste Ville and his son André can be seen a classic example of the meritocracy of the third French republic. The farmer's son gets an education and a government job, marries into a family of schoolteachers, and he and his wife raise a son who can succeed in the competitions for entrance into the nation's top schools and then into academia or even into the top echelons of the state bureaucracy. But meritocracy is never for everyone. You need a head start – the Villes were landowners – and determination. André's education was evidently a priority for Baptiste and Marie. For his benefit, they spoke French, not Catalan, at home. They did not send André to one of the public elementary schools in Marseille. They sent him to a Catholic elementary school, where the brothers could properly educate him in morality and the French language. After primary school, they had to pay even more, because the secondary schools that prepared students for the baccalaureate all charged tuition in those years – even the "collèges" that received funds from local governments and the "lycées" belonging to the state [50].

In 1920, when André was ten, Baptiste earned another important promotion at the PTT, to the rank of inspector (*contrôleur*). The price of the promotion was spending three years far from home, in the small but ancient city of Soissons, about 100 kilometers northeast of Paris in an area that had been badly damaged during World War I. There André attended the College of Soissons, a school with a long history.

⁴The "tg" is pronounced like the English "ch".

⁵Born in 1911, Marie was the daughter of Jean Ville, André's uncle and godfather. She married Jean Argelès in 1933.

Back in Marseille, France's second largest city, in 1923, Baptiste and Marie faced the problem of continuing their teenager's education at the lycée level. Could André have gained admission to the lycée of Marseille, later named the Lycée Thiers, where the city's bourgeoisie sent their sons? Could Baptiste, who was earning 10,000 francs a year in 1923, have paid to send him there? Perhaps, but we have reason to believe that André was sent thirty kilometers away, to be board at the Lycée Mignet in Aix en Provence. Ville's personnel record⁶ shows that he passed his first baccalaureate, in letters, in Aix en Provence in June 1926. This was a time when many lycées were struggling to maintain their enrollments in the face of the falling birth rate and the impoverishment of the middle class resulting from the war. The republic was concerned about whether it would be able to replace its cadres, and many lycées were offering scholarships to attract bright students as boarders.

Marie Argelès recounts that Baptiste appealed to her family back in Mosset to send her sister Georgette (1908–1991) to Marseille to live with him and his wife, because he would be so lonely without André. The family deliberated about this surprising request but finally said no. “Children are not for lending,” Marie's father Jean told his brother.⁷ During his final year, however, André did apparently attend the lycée in Marseille, for it was there that he passed the second baccalaureate, in mathematics, in June 1927.

André's family bridged the two great institutions of the third republic: the state and the Catholic church. The meritocracy of the republican state permitted Baptiste and André's advancement, but we can be sure that both the landowning Villes and the educated and religious Vernets voted on the right. Both of his mother's brothers were priests in Mosset when André was a teenager: uncle Benjamin was the village priest starting in 1917, and uncle Théophile served as his younger brother's assistant after retiring from another parish in 1922.

Almost thirty years before André was born, his aunt Alexandrine, then a young schoolteacher, had been involved in a notorious clash between church and state. In 1880, Alexandrine was assigned to teach in Nohèdes, a village even more remote than Mosset. To reach Nohèdes, you continue up the Têt beyond Prades, then climb a narrower mountain valley, accessible at the time only by foot or mule. Alone in this remote village, Alexandrine was welcomed into the home of two kind-hearted middle-aged sisters, Marie and Rose Fonda, who also extended their hospitality to the village's energetic young priest, Joseph Auriol. Alerted to rumors of inappropriate ties between Alexandrine and Joseph, the inspector of schools transferred Alexandrine to

⁶National Archives in Paris: CARAN F/17/27255.

⁷An alternative hypothesis is that André's stint at a boarding school was at Soissons – that he continued there for a semester or more to complete his middle school after his parents had moved back to Marseille in January 1923. This would not exclude his also having boarded at Aix en Provence, but perhaps there could be a different explanation for his baccalaureate being there.

Taurinya, in the mountains the other side of the Têt. This was not enough, it seems, to cool Joseph's ambition to find the means to leave the priesthood and marry her. On July 18, 1881, Marie Fonda died. On August 19, Rose Fonda accompanied Joseph to Perpignan, where she signed a will granting him her entire estate. On August 30, Rose died. By September 24, Joseph had liquidated all her property, netting a handsome 16,000 francs. On September 25, he was arrested for poisoning the two sisters, and 11,000 francs were found in his pocket. The case dragged on for a year, as the republican press denounced the lecherous and murderous priesthood. Alexandrine, suspected of having the missing 5,000 francs, was not to be found. Hidden by the clergy for 14 years, she finally emerged, after her parents' death, to marry a widower and help raise his daughter.

The scandal of the priest of Nohèdes is too good a story to die. It has been retold repeatedly by popular French authors, including Pierre Bouchardon in 1933 [19], Pierre Bécot in 1981 [12], and Lionel Dumarcet in 1999 [36]. Some, like Bécot, still question the judgement of the court that condemned Joseph Auriol to life imprisonment with hard labor. Auriol was carrying prussic acid when he was arrested, but the sisters Fonda were sickly, poison was never found in their bodies, and the prosecutor was a Protestant.

Ville knew his Aunt Alexandrine; she did not die until 1931, at the age of 75. It seems unlikely that he ever discussed the events of her youth with her, with his even older aunt Eugénie, or with his uncles the priests. But that was the elderly, childless side of the family. He surely heard all the gossip from his seven cousins on his father's side, six girls and a boy. Did the old story play some part in André's life choices?

The story of Alexandrine may have contributed at an intellectual level to André's disinterest in religion and cynicism about politics, but he took into his adulthood a far more personal and damaging family secret. On June 25, 1927, the day following his 17th birthday, André's father Baptiste shot himself at the age of 56. Baptiste had just discovered that his wife Marie, herself 51 years old, had a lover.

Marie's two brothers, the Mosset priests, rushed to Marseille to cover up the circumstances of the death. Baptiste's brother Jean, André's uncle and godfather, suspecting something was afoot, rushed after them, descending the mountain by foot to catch the train from Prades to Marseille, so as to discover the truth and let the family know what had happened. But it remained a family secret. The Mosset priests gave Baptiste a Catholic funeral, forbidden for suicides. The truth was not told outside the family until 2008, when Marie Argelès recounted it to Jean Parès and to me. After the suicide, the Mosset Villes finally saw an explanation for Baptiste's request that Georgette come to live with him and his wife in André's absence, and they even regretted not sending her.

Georges Th. Guilbaud, reflecting in 2007 on his acquaintance with Jean Ville in the 1950s, believed that Ville's refusal to speak of himself betrayed

deep personal wounds.⁸ Surely his father's death was the deepest.

It goes without saying that André's subsequent relations with his mother were difficult. His cousin Marie remembers his rebuking his mother in front of the family. But they continued to be close. She always supported his studies, and when she died in 1955, he inherited all her property. He was the only heir of the entire Vernet family.

His father's death seems to have deepened André's relationship with the other members of his family. There had been a split in the family; his uncle Pierre had quarreled with his father Julien and his brothers, Jean and Baptiste. Pierre was a businessman as well as a farmer. He had experienced financial problems when a worker he had employed had been injured on a road-building project, and he had not been able to keep financial obligations to his father. And yet when his father had died, he had expected to share equally in the inheritance with his youngest brother, Jean, who had stayed on the farm to help his parents. All in all, Pierre was a rebel. He might have even voted on the left. André kept on close terms with his uncle and godfather Jean, but he also made friends with Pierre after his father's death.

After his second baccalaureate, which nearly coincided with his father's death, André continued to study at the lycée in Marseille, throwing himself into the intensively competitive two years of study for those who wanted to compete for entrance into the various advanced schools, the *grandes écoles*. Then, as now, each of the *grandes écoles* held its own competition, but the curriculum for the two-year preparatory schooling, offered by the top lycées, was the same for all the competitions.

There were a number of *grandes écoles* in André's time, and there are many today – engineering schools, business schools, and others. But then as now, the two most prestigious were the Ecole Polytechnique, which admitted several hundred students a year, and the Ecole Normale Supérieure, which admitted several dozen. Both provided full scholarships for all their students and gave them a path to become career government employees. Graduates were expected to repay the cost of their training if they choose to leave government service. The Ecole Polytechnique was administered by the army; its graduates, called engineers, acquired the habit of command and served at the top of all the branches of the French bureaucracy. Graduates of the Ecole Normale Supérieure were considered teachers; at the end of their three years at the school, they were expected to participate in the *agrégation* competition to qualify for positions in the lycées. Sometimes they went on to become inspectors in the lycées or administrators in the educational bureaucracy. In exceptional cases, they might be allowed to prepare a doctoral thesis and become a university professor.

In 1929, André took the week-long written and half-day oral examina-

⁸Georges Théophile Guilbaud (1912–2008) was an important contributor to operations research and mathematical economics in France after World War II [48]. I am grateful to him and his daughter for the opportunity to interview him by telephone in December 2007, a few months before his death.

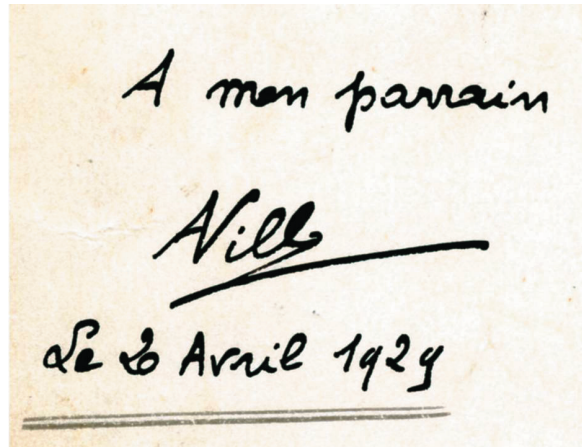


Figure 3: Photograph of Jean André Ville, inscribed to his godfather (*parrain*) and dated April 20, 1929.

tions for the Ecole Normale Supérieure and the Ecole Polytechnique. On the written examination for the mathematical section of the Ecole Normale Supérieure (there was also a literary section) he scored number one in the nation; after the oral examination he ranked fifth. In the competition for the Ecole Polytechnique, he ranked eighth. He chose the Ecole Normale Supérieure. He evidently saw himself as a future scholar, not a leader of men.

André was not the first normalian from Mosset. Philippe Arbos, born the son of a schoolteacher in Mosset in 1882, entered the Ecole Normale in 1902 and became a leader in French geography from the 1930s to the 1950s. André's achievement was nevertheless extraordinary. One of the clichés of the third republic was that it took three generations of baccalaureate degrees to make a normalian – three generations to accumulate the cultural capital needed to raise a youngster who could compete intellectually with the best of the nation. André's grandfather had been a farmer.

André's remarkable performance on the written examination for the Ecole Normale tells us he was a first-rate master not only of French mathematics but also of the French language. He wrote with an easy elegance unusual among his fellow mathematicians, combining what the French physicist André Blanc-Lapierre called great subtlety of analysis [13] with what the Romanian statistician Octav Onicescu called a clear, simple, and concise style [65].

Why did the oral examiners for the Ecole Normale lower André's rank from first to fifth? Did he lack the self-confidence needed to bring his powers of insight and analysis to bear in the give and take with his examiners? Or did he simply sometimes balk at responding the way they wanted? We cannot know, but the record does tell us that he never acquired the skills needed

to take full command of the situations into which his intellectual prowess propelled him.

3 Ecole Normale Supérieure, 1929–32

André and his male classmates at the Ecole Normale lived in the school's compound on the *rue d'Ulm* (Ulm street), near the Pantheon; there was separate housing nearby for female students. The normalians were young adults, already nineteen or twenty years old when they entered, their characters largely formed, and they enjoyed great freedom to cultivate their cultural and social interests in Paris. The gate to the compound on the *rue d'Ulm* was always open, and except perhaps for the third year, when they had to cram for the agrégation as they had done for the entrance competition, they had the time and even the means to enjoy themselves. As the brightest young students France had to offer, they could supplement their stipends with tutoring assignments from well-heeled Parisians (*tapirs*, in the school's slang), or with part-time teaching assignments in schools around Paris [72, pp. 12–14].

The four students who had been ranked above André in the entrance competition for the Ecole Normale all decided to enter the Ecole Polytechnique instead. So André entered as the first-ranked student in his class – what was called the *cacique* in the school's slang. This was a leadership role. In his second year, when no one showed up to listen to Professor Denjoy, a notoriously poor lecturer, it was André's job to set things straight – to apologize to Denjoy and to arrange that two or three students would always show up during the rest of the semester. The status of *cacique* would serve him well throughout his career.

Much of what we know about André's years at the Ecole Normale comes from Bernard d'Orgeval Dubouchet (1909–2005), a gregarious classmate who roomed with André in their third and final year at the school, introduced him to his wife, and wrote his obituary in the yearbook of the alumni association after his death [66]. D'Orgeval was a royalist, very active in the right-wing *Action française*. By his own account, he had sabotaged himself in the competition for admission to the Ecole Polytechnique by showing his disdain for the republican military. A year later, he entered the Ecole Normale along with André. His passion was politics and history; he studied mathematics because he found it easy. He eventually became a university professor of mathematics at Dijon, taking over the family vineyard at Beaune and participating in the local historical society [1]. In his retirement, he wrote an autobiography for his children, with a chapter on the years he and André spent at the Ecole Normale, 1929 to 1932.

André and d'Orgeval were in the science section of the school; there was a larger section for letters. Figure 4 shows André and d'Orgeval posing along with most of their classmates in the science section. André is wearing the



Figure 4: Ville and his fellow male students in the science section of the class that entered the Ecole Normale in 1929.

Front row, from left to right:

1. Pierre Chatelain. Physics. University of Montpellier.
2. Bernard d'Orgeval. Mathematics. University of Dijon.
3. Simon Durand. Mathematics. Lycée at Saint-Cyr.
4. André Ville. Mathematics. University of Paris.
5. Jean Coutard. Mathematics. Lycée Louis le Grand in Paris.

Middle row:

1. Robert Guillien. Physics. University of Nancy.
2. Henri Guimiot. Physics.
3. René Dixsaut. Physics. Lycée in Paris.
4. André Guillemonat. Physics. University of Marseille.
5. René Gouyon. Mathematics. University of Toulouse.
6. Roger Servant. Physics. University of Bordeaux.

Back row:

1. Roger Bretagnolle. Mathematics. Lycée at Clermont, regional inspector.
2. Jules Farineau. Physics. Killed at the front, May 10, 1940.
3. Joanny Commeau. Mathematics. Lycées at Dijon and Strasbourg.
4. Jean Chauvineau. Mathematics. Politics, then University of Caen.
5. Joseph Benoit-Cattin. Physics. Administrator.

Not in the photograph:

1. Charles Pisot. Mathematics. University of Paris.
2. Claude Chabauty. Mathematics. University of Grenoble.

gray housecoat that was the uniform for everyday work in the school.

In André's time, the mathematicians usually spent three years at the Ecole Normale, while the physicists spent four. Both groups studied for the agrégation during their final year. Before that, they could earn degrees at the University of Paris. Degrees were awarded on the basis of examinations, which the normalians took alongside classmates from the lycées who had entered the university two years earlier, right after earning their baccalaureate. At the end of their first year at the Ecole Normale, they took examinations for the certificates that university students usually earned after three years (often equated with bachelors degrees in the United States). Then they studied for more specialized degrees then called *diplômes d'études supérieures* (DESS; often equated with masters degrees in the United States).

When André arrived, the university's mathematics teaching was housed at the Institut Henri Poincaré, in a modern brick building a few steps from the Ecole Normale. Built with funds discreetly provided by the Rockefeller Foundation, the building had been inaugurated just a year earlier, in November 1928. The institute was presided over by Emile Borel (1871–1956), the powerful professor who held the university's chair in probability and mathematical physics.

Borel was a towering but distant figure for the normalians. He himself had entered the Ecole Normale in 1889, having ranked first not only in its entrance competition but also in the competition for the Ecole Polytechnique. He had come from a small town in southern France like André, but from a much more intellectual environment; his father was the Protestant pastor and schoolmaster in Saint-Affrique, a town larger than Prades, and he had studied for the competition for the grandes écoles at the Lycée Henri-Quatre in Paris. There, before even entering the Ecole Normale, he was a protégé of the prominent mathematician Gaston Darboux (1842–1917), later his thesis director. In 1901 he married Marguerite Appell (1883–1969), the daughter of Paul Appell (1855–1930), a mathematician who was to serve for decades as dean of the faculty of sciences and rector of the university at Paris. In 1921, he was elected to the French Academy of Sciences, and from 1924 to 1936 he combined his work at the university with service in the French parliament.

Borel began in pure mathematics, but his was a very broad intellectual culture. For more than a decade starting in 1905, he and Marguerite, who wrote novels under the name Camille Marbo, reviewed developments in science, culture, and politics in their own journal, the *Revue du mois*. In 1909, Borel put his mark on mathematical probability with a flawed but extraordinarily influential article in the *Rendiconti del Circolo Matematico di Palermo* [16], which brought measure theory into probability and introduced what we now call the strong law of large numbers. About the same time, he began to promote the study of probability and statistics, with a stream of courses, textbooks, and popular expositions that continued into the 1950s.⁹

⁹Pierre Guiraldenq's biography of Borel is the most comprehensive [49]. Maurice



Figure 5: Camille Marbo in her office around 1905, when she and her husband used the 10,000 francs he had received as part of the Petit d’Ormay prize to launch the *Revue du mois*. “Marbo” was a contraction of her married name, Marguerite Borel.

When the Rockefeller Foundation set out to support European science in the early 1920s, they set themselves the same objective as in the United States: make the peaks higher. The European science that impressed them most was German mathematical physics, and the highest peak was at Göttingen, where Hilbert, Klein, and Courant led the strongest mathematics group in the world, and Landau and Born were at the forefront of quantum physics. In 1926, the foundation granted \$350,000 to the university at Göttingen, \$275,000 for a new mathematics institute and \$75,000 for physics.

After due deliberation, the foundation concluded that the second highest peak was Paris, which also had the advantage of its world-wide cultural and intellectual influence. When the Harvard mathematician George Birkhoff and other Rockefeller representatives visited Paris in 1926, they found a ready and able partner in Borel, long a proponent of the new physics and the importance of mathematics in it. When the Americans noted how little it would cost to hire more Paris faculty, Borel carefully explained why and how faculty salaries, ravaged by postwar inflation, would soon rise. When they emphasized the need for matching funds from private French sources, he assured them such funds would be available. He proposed to name the institute for the renowned mathematician Henri Poincaré (1854–1912). The foundation provided \$100,000 for the new institute in 1926, matched by \$25,000 from Edmond de Rothschild. In 1928, the foundation provided another \$80,000

Fréchet’s is the best account of Borel’s scholarship [44], and Collingwood’s is the best account in English [31]. Mazliak tells the story of the *Revue du mois*, see [57]. Borel’s wife’s autobiography [55] gives a sense of the times. See also [23, 28].

to support new faculty positions.¹⁰

The university made the agreed-on new appointments in mathematical physics. Louis de Broglie (1892–1987), of quantum-mechanics fame, was appointed to a chair, and Francis Perrin (1901–1992) was appointed *maître de conférences*.¹¹ But Borel also had another agenda: probability and statistics. His colleagues in the Faculty of Sciences were far too conservative to countenance new chairs in such applied subjects, but he found ways to bring two senior mathematicians to Paris to attend to them: Maurice Fréchet (1878–1973), who came from Strasbourg to develop probability, and Georges Darmon (1888–1960), who came from Nancy, at first just one day a week, to develop mathematical statistics.

The Rockefeller Foundation, which soon shifted to supporting molecular biology rather than mathematical physics in Europe, did not feel betrayed. In 1938, when Borel asked the foundation for modest additional financial support for visitors, George Birkhoff and Warren Weaver evaluated the proposal positively. Weaver noted that Borel’s institute was “primarily concerned with the foundation of probability theory and, to some extent, the applications of this theory in the field of statistics . . . , the one branch of mathematics which is most closely and significantly related to biological and medical research.” Birkhoff praised Borel’s farsightedness in building the institute around probability and statistics.¹²

In 1923, Borel had been one of the creators of the *Institut de Statistique de l’Université de Paris* (ISUP), an interdisciplinary institute that offered courses and certificates in statistics, partly outside the auspices of the university [62]. This teaching had been housed in the facilities of the Faculty of Law, but Borel now moved it to the new Institut Henri Poincaré. With Fréchet and Darmon on board, he also created new university degrees for probability and statistics. Borel had been offering a DES under the auspices of his chair in probability and mathematical physics. Now he split this degree into three options: an option emphasizing probability managed by Fréchet, an option emphasizing statistics managed by Darmon, and an option emphasizing physics managed by Perrin. Fréchet’s option was called *compléments théoriques*. As Fréchet later explained, it strengthened the previous degree by increasing its mathematical requirements, so as to attract stronger students, whereas the option in statistics relaxed the requirements of the previous degree so as to serve a wider class of students [44].

André studied the usual topics in mathematics in his first year at the Ecole Normale, 1929–1930. He may have attended Borel’s elementary course

¹⁰See Reinhard Siegmund-Schultze’s detailed study of the Rockefeller Foundation’s contributions to internationalizing mathematics [81].

¹¹Literally, “master of lectures”. In French universities at the time, this was the beginning rank for permanent faculty, comparable to the rank of assistant professor in the United States. A young person with this title would aspire to the title of professor and a chair.

¹²See pp. 48–49 of Beaulieu [5] and p. 175 of Siegmund-Schultze [81].

in probability the spring of 1930, but Borel was hardly there; d'Orgeval recalls that he took a telephone call from the president of the republic a few minutes after the second meeting began, and his assistant handled the course for the rest of the semester. In 1930–1931, André studied for Fréchet's DES in probability, which he would have found more serious, and in March 1931 he was one of the first six students to take the examination for it. He was the only normalian among the six. A larger group, eleven students, took the examination for the new DES in statistics. They included d'Orgeval and Jean-Louis Destouches, another of André's life-long friends, a non-normalian who later earned a doctorate in physics under de Broglie. D'Orgeval recalled that on the days Darmois came to Paris from Nancy to lecture, he would spend his time outside of class at the Café Balzar, on the *rue des Ecoles*, where he once invited d'Orgeval to sit and chat. André did not bother with Darmois' DES, but he and d'Orgeval were among a much larger group of students who took the examination for the DES in rational mechanics in June 1931.

André and most of his classmates in mathematics sat for the agrégation at their first opportunity, as they were expected to do, in the spring of 1932. It was a competition. Any student who had earned a DES at the university could enter, but the normalians usually performed best. A student who was accepted could look forward to a career as a lycée or university teacher, with the privileges and benefits of a national civil servant. (Formally, there was only one university in France, and the lycées were part of it; the rector in each university city was responsible for the university faculties in that city and for the lycées throughout the adjoining region.) Separate competitions were held in Arabic, English, German, grammar, history and geography, Italian, letters, mathematics, philosophy, physics, and Spanish; in some of these subjects, including mathematics, there were separate competitions for women. The numbers of candidates who were accepted in the competition depended on the current needs for lycée professors. In 1932, 204 candidates were accepted altogether. In the mathematics competition for men, 21 were accepted. Eight were normalians in André's class, one was a normalian from an earlier class, and the other twelve were not normalians.

As in the entrance competition for the Ecole Normale, there were two steps in the competition – a written examination followed by an oral examination. Once again, André did better in the written examination. He was ranked 2nd among all the candidates after the written examination, but the oral examination, held on June 13, lowered him to 6th. The president of the jury gave this explanation in his report, dated August 3:

Mr. Ville did not give the impression one could have hoped for in the oral. His scientific knowledge is of the utmost seriousness, and he has great finesse on this terrain. But he seems to make a serious effort only on subjects that particularly interest him.

André's performance in the written examination suggests that he had pre-

pared all the possible topics, but the jury's reaction and later evidence suggest that he never hid his strong opinions about which mathematics was interesting. The president of the jury added that André had asked for a fourth year at the Ecole Normale on his return from his military service, and that this was a legitimate request. The implication was that he would be allowed to prepare a thesis for the doctoral degree.¹³

Charles Pisot, who had entered the Ecole Normale second to André, ranked first on the agrégation. Among the eight normalians of the class of 1929 who were accepted, André was fourth. This lower rank, after three years of being the cacique, must have been a personal blow, and it had real implications. These student rankings could influence appointments and promotions throughout one's career.

In the end, André's class did much better than they might have expected. In the early 1940s, the Ministry of Education looked at the careers of members of the classes entering in 1920 and 1930 and found that the traditional pattern held: a large majority of both classes were teaching in lycées. In the sciences, only four out of 21 members of the class of 1920 and 2 out of 19 members of the class of 1930 held faculty positions in French universities. But as we see from Figure 4, where André's classmates' eventual positions are listed, the expansion of the French universities after the war changed the picture: a majority of his class were university teachers when they retired. Even d'Orgeval, who ranked 6th among the 8 members of the class accepted in mathematics in 1932, enjoyed a long career as a university professor.

André was back in Mosset in the summer of 1932. He cut a wide swath there during his normalian years: a Parisian with a bevy of female cousins to show him around. According to village memory, he gave lessons in the Argentine tango. One of the Mosset girls, Louissette, returned the favor by teaching him the waltz, which he pretended not to know. His mother was not pleased, reckoning he could do better than an uneducated girl from Mosset. He did not engage so much with the young men in the village, for his preoccupations were quite different from theirs.

We do not know how he celebrated his success in the agrégation with his father's side of the family, but the parish bulletin records an unusual ecclesiastical celebration organized by his uncle Benjamin, still the village priest. On the 14th of September, Benjamin brought the clergy of the area together for a celebratory dinner in Mosset. The grandiloquent after-dinner toast, probably pronounced by Benjamin's superior at Perpignan, takes up ten pages in the bulletin. It celebrates André's success, mentioning his prospect for a doctorate, but it is also a plea to a prodigal son, the wayward intellectual, to return to the fold. It surveys the glories and accomplishments of French science to prove that all learning and scientific research is a metaphysical quest, a way of drawing closer to God.

¹³The report is in the part of his personnel file preserved in the National Archives in Paris: CARAN F/17/27255.

The 1920s had been a time of revival of Catholicism among the French elite. A majority of André's fellow normalians attended mass; many adhered to a group that called themselves the "Tala", from "ils vont à la messe", or "they go to mass". But we find no trace of religious devotion on André's part, and uncle Benjamin was surely right to worry that he had emerged from his studies imbued with an intellectual self-importance that distanced him from God. The typical normalian had a father and a family with considerable stature in their community. André did not have that in Marseille, and he could hardly have identified with his uncles, the priests and farmers in Mosset. He must have found his identity in his academic achievement. Fifty years later, his students would discern that intellectual originality was Jean Ville's highest value.

4 Probability in Paris in 1932

Looking back from the 1980s to his study at the University of Paris over fifty years earlier, Jean Ville remembered little serious research in the topics that later engaged him. Probability, he recalled, was looked upon as an honorable pastime for those who had already distinguished themselves in a branch of pure mathematics such as analysis. Borel had made a reputation in the theory of functions and measure theory, Fréchet in the topology of abstract spaces, Darmon in relativity theory. Having excelled in these serious occupations, they had the right to amuse themselves. Ville remembered Fréchet lecturing on Borel's denumerable probability and Cantelli's strong law of large numbers, but the Paris faculty, as he recalled, knew nothing about Markov chains. Boolean algebra and set theory were also regarded as topics of entertainment, not serious research, and they were seldom taught. David Hilbert's work on logic was hardly known; it was only from a Romanian student who took the DES in probability with him in 1931 that Ville learned about the existence of propositional functions [33, 91].

Like most autobiography, these recollections form a picture that is neither complete nor entirely accurate. Most inaccurate and perhaps most revealing was Ville's assertion, made in passing to Pierre Crépel in 1984, that the Paris faculty knew nothing about Markov chains. Jacques Hadamard, the most encyclopedic of all the Paris mathematicians, had helped create the theory of Markov chains with his work on card shuffling in the 1920s. Hadamard was not part of the Faculty of Sciences of the University of Paris; he was at the venerable College of France in Paris, where professors give lectures open to all comers, never examining students or awarding degrees. But Fréchet and Darmon participated in the excitement about Markov chains at the International Congress of Mathematicians at Bologna in 1928, and Markov chains were the main topic of research by Fréchet and his students in the 1930s [24, 67]. The third topic in the syllabus for the DES in probability that Ville earned under Fréchet in March 1931 was card shuffling and Markov

chains.

Wolfgang Doeblin, the young Jewish German refugee who appeared at the University of Paris in 1933, just as Ville left for Berlin, started his own brilliant research on probability by mining the articles on card shuffling Hadamard had published in the *Comptes rendus*. Ville could have done the same, much earlier. He erasure of Markov chains from his memory of what he had learned from Fréchet may betray a regret that Borel and Fréchet had steered him in a different direction.

An important truth underlying Ville's recollections is that probability, for Borel and Fréchet, was an application of analysis, the branch of mathematics that grows out of the differential and integral calculus. This view was not unique to Paris. When the *Zentralblatt für Mathematik und ihre Grenzgebiete* was founded in Berlin in 1930 to provide timely reviews of the world-wide mathematical literature, it classified probability and statistics as a subfield of analysis. Only in 1937, after Andrei Kolmogorov had persuaded Fréchet and others that the abstract version of Lebesgue integration Fréchet had developed should be treated as an autonomous axiomatization for probability [80], did the *Zentralblatt* recognize probability and statistics as a field of its own, on a par with fields such as analysis, geometry, group theory, and so on.

For Borel and Fréchet, it was obvious that Ville, their star student in probability, should follow in their footsteps and those of other top probabilists, such as the Frenchman Paul Lévy (1886–1971) and the Russian Andrei Kolmogorov (1903–1987). He should write a thesis in analysis. This was not bad advice; even today we send our best students in probability to study as much analysis as possible. But there was a problem. First-rate ongoing work in analysis was no longer to be found in France in 1932.

Fréchet was the obvious thesis director for a probabilist in Paris. His work on functional analysis and abstract spaces was well known and influential in Russia and the United States. Norbert Wiener (1894–1964) later recalled that he had regarded Fréchet so highly in 1920 that he would not have been surprised had Fréchet turned out to be “the absolute leader” of mathematicians of his generation [97, p. 50]. Fréchet had helped re-establish the French university at Strasbourg in the 1920s, and now as a Paris professor he corresponded with mathematicians world-wide, looking for every opportunity to advance the cause of French science. He was an international leader of the new generation of mathematicians who saw functional analysis as the foundation for probability and statistics. For Kolmogorov in 1931, as for Wiener in 1920, advertising one's own contribution to mathematical probability meant going to France to talk to Fréchet. But for all that, Fréchet was not at the forefront of analysis. He had not worked in analysis since the war.

We might have expected that Ville would be mentored in the cutting edge of mathematical research by a generation of French mathematicians much younger than Borel and Fréchet. But this intermediate generation

had largely disappeared in the war. As Ville explained to Pierre Crépel in 1984 [33], graduates of the Ecole Normale tended to be platoon leaders, and the French generals, especially in the early years of the war, had ruthlessly sacrificed them and their platoons. Of the 280 students who entered the Ecole Normale from 1911 through 1914, 101 were killed in the war [58].

For Ville, as for other young mathematicians in Paris at the time, there was an obvious conclusion: they needed to go abroad.

In January 1926, George Birkhoff, Solomon Lefschetz, E. H. Moore, and Oswald Veblen, perhaps the most distinguished mathematicians in the United States, submitted reviews of current European mathematics to the Rockefeller Foundation. Reinhard Siegmund-Schultze has tallied the names they mentioned, obtaining this list of the European nations with the most top mathematicians [81, p. 45]:

Germany	19
Italy	11
France	9
England	7

Paris could be considered the strongest single center for European mathematics, because France concentrated its mathematics, along with the other branches of its arts and sciences, in its capital. But as a nation, Germany was at the top, as it had been for fifty years. It had not, moreover, so ruthlessly sacrificed its young elite in World War I.

In the aftermath of the war, Emile Picard (1856–1941) and Gabriel Koenigs (1858–1931), two of the most senior of the Paris mathematicians, had led an effort to boycott German mathematics. In their eyes, Germany had forfeited, with its brutal military tactics during the war, any right to participate in the life of civilized nations. Their campaign had some success, further deepening German bitterness; mathematicians from Germany and its wartime allies Austria, Hungary, and Bulgaria were not invited to the International Congresses of Mathematicians in Strasbourg in 1920 and in Toronto in 1924. The boycott was opposed by the United States and eventually France's other allies as well, and by the mid 1920s, most of the French had come to terms with reality: they were isolating themselves rather than the Germans. In 1925, the French and German governments tried to settle their political differences with treaties negotiated in Locarno, Switzerland, and subsequently most French intellectuals, including mathematicians, hoped for a cultural Locarno – a restoration of the intellectual and cultural exchanges between France and Germany that had existed before the war. Now it was the Germans' turn to sulk. When the German mathematicians were finally invited to the International Congress in Bologna in 1928, participation was opposed by conservatives, including Erhard Schmidt (1876–1959), the great analyst at Berlin who was then president of the union of German Mathematicians, the DVM. Pointing to the intellectual weight of German mathematics, the conservatives argued that any international organization for mathematics should be under German leadership. David Hilbert (1862–

1943), the most distinguished of the German mathematicians, argued for participation, and in the end Hilbert led a delegation to Bologna that was larger than the French delegation.¹⁴

Even after Locarno, there were no government-sponsored programs of cultural exchange between France and Germany. In the case of mathematics, the Rockefeller Foundation stepped into the breach. Aiming to assure United States access to European advances in mathematics and physics while also fostering European reconciliation, the foundation began funding foreign study by European mathematics students in the mid 1920s, at the same time as it was funding the institutes at Göttingen and Paris. By 1933, it had provided funding for stays in other countries, often for a year or more, for 97 European mathematics students, of whom only 19 were brought to study in the United States. Fourteen of the 97 students were French, and eight of these spent time in Germany.

Four of the eight French mathematicians that the Rockefeller Foundation sent to Germany, Jean Dieudonné (1906–1992), Paul Dubreil (1904–1994), René de Possel (1905–1974), and André Weil (1906–1998), were later founding members of the influential Bourbaki collective, which set out to redo classical mathematics with a rigor and austerity that they perceived in German mathematicians but not in their French elders. A fifth, Marcel Brelot (1903–1987), though never part of Bourbaki, shared its ideology. Most of the other founding members of Bourbaki found other funding for travel to Germany.¹⁵

Two members of Ville’s class at the Ecole Normale – Charles Pisot and Claude Chabauty – became members of the Bourbaki group. But Ville did not follow that path. As we shall see, he did make an effort to emulate Brelot, de Possel, and Weil by studying with the Berlin analyst Erhard Schmidt. But for him, the rigor of the German mathematicians was no more attractive than the pedantry of the French schools. He did not view his French mentors with contempt as Bourbaki did; his own style of thought turned out to be the most Borelian of his generation. But he found the key to his own career in a different place and style – in the riotous flourishing of new mathematics and applications in Vienna. In the end, he was as contrary with respect to his elders as Bourbaki, but in an opposite direction; starting with probability and statistics, he moved to topics even less respectable in the world of French academic mathematics: game theory, mathematical economics, information theory, signal theory, operations research, logic, and computing.

¹⁴Olli Lehto and Sanford Segal have written on the exclusion of the Germans from the ICM [52, 77], and Segal has described the attitudes of Schmidt and other German mathematicians in detail [78]. Bernard Bru has described the Bologna conference [24].

¹⁵Siegmund-Schultze details the Rockefeller Foundation’s support for European mathematicians [81]. Beaulieu chronicles the German experiences of Bourbaki [5].

5 Lucie

We know from Lucie Georgette Ernoult's marriage certificate that she was born in the 14th arrondissement of Paris on April 19, 1912. The 14th arrondissement includes the Montparnasse railroad terminal, which provided the city's connection with the province of Brittany, and it was known for its concentration of Bretons. It seems that Lucie's parents were from Brittany; her mother's maiden name was Nédélec, which means Christmas in Breton, and her natural father was a science professor in the lycée in Quimper named Kerbriant. Ernoult, her mother's husband, was not Breton; he was from the Sarthe, nearer Paris, and worked in the offices of a hospital in Paris.

Lucie came into André's life by way of Bernard d'Orgeval. D'Orgeval recalls that he first met Lucie in early 1931 in the company of two friends at the Capoulade, a famous cafe at the corner of *boulevard Saint-Michel* and *rue des Ecoles* (now the site of a MacDonalds). She became a regular part of their group, and d'Orgeval learned more about her when she agreed to accompany him to a horse show that did not interest any of his other friends. She would not say much about her mother; d'Orgeval gained the impression that her mother was institutionalized. She had completed only elementary school. Her father (we cannot be certain whether Ernoult or Kerbriant is meant) gave her a little money, and she worked occasionally in offices or as a sales clerk. She was an attractive woman, and she later boasted that she had modeled swimsuits in stores. She was living with a medical student, Othman Sfar, from a very prominent Tunisian family, at the Hotel Globe on *rue Monge*, in the Latin quarter. Sfar was in love with her and contemplated breaking with his family to marry her. But it was out of the question for a woman to accompany him when he was out with his friends, and so she was free to go out on her own, and she fell in with d'Orgeval's group.

Lucie accompanied d'Orgeval to political meetings as well as to places of entertainment. She even played a role in putting her Tunisian friends, who were connected with the political faction in Tunisia that became the neo-Destour party, in touch with d'Orgeval and his friends in the Action française. The Tunisians thought that the Action française might soon be in charge in France, and that they might be able to make a deal. D'Orgeval talked with them from time to time and even visited Tunisia in September 1931.

The most intellectual of the right-wing political leagues of the time, the Action française was popular among French lycée and university students in the 1920s and 1930s. Its intellectual leader was Charles Maurras (1868–1952), an influential journalist and poet, who advocated a restoration of the monarchy and the elimination of the influence of Judaism, freemasonry, and foreigners in France. Maurras was not religious. He favored the restoration of Catholicism, but in a role so subordinate to monarchy and tradition that the Pope excommunicated the Action française in 1926. The adherent of the Action française now most remembered is Robert Brasillach (1909–1945),

who entered the literary section of the Ecole Normale in 1928. An enthusiastic supporter of Germany during the occupation, Brasillach was tried and executed for collaboration by the Gaullist government after the liberation. D'Orgeval himself spent the entire war in a German prison camp, but when he returned in 1945, his condemnation of the collaborators was combined with anger that the liberation also brought punishment for some, like Maurras, whom he considered guilty of nothing but having been on the right in the 1930s.

Histories of the political movements among lycée students and normalians between the two wars have emphasized the teachers and students on the literary side – the *khâgneux* who studied history and literature in the lycées to compete for entrance to the literary section of the Ecole Normale, rather than the *taupins*, who studied mathematics to compete for entrance to the scientific section.¹⁶ This is natural, for the *khâgneux* exercised a wider influence and left a record for posterity by writing about their ideas. But d'Orgeval's example reminds us that the mathematicians were also present on the ground. When Brasillach left the Ecole Normale, it was d'Orgeval who took over as the official leader of the Action française at the school. Right-wing leagues ruled the streets in the Latin Quarter in those years, and although the leader of the student section of the Action française, Georges Calzant, made sure that the normalians were not involved in any operations that might lead to arrests, d'Orgeval organized their participation in peaceful marches and other demonstrations, such as the Jeanne d'Arc march each year on May 8.

In the spring of 1931, Lucie came to the annual garden party of the Ecole Normale, where she met André. Their relationship struck d'Orgeval as platonic, until the holiday of the 14th of July. Normalians would normally be on summer vacation then, but André and d'Orgeval were still in Paris for examinations connected with their mandatory military training. André and Lucie apparently spent the night together after going dancing at the Place d'Italie. D'Orgeval was surprised, as he put it, that André would choose someone who had belonged to another man, but they were evidently in love. Lucie hesitated to leave Sfar, who was also in love with her and was trying to sell enough assets that he could afford to stay in France and marry her, but she eventually choose André.

During 1931–1932, their third year and final year at the Ecole Normale, André and d'Orgeval roomed together. Their work that year was to study for the agrégation, under the tutoring of Alexis Hocquenghem, the *agrégation-préparateur* that year. D'Orgeval tells about going out with André and Lucie, and watching them dance, but he does not mention working with André on the agrégation. It was Charles Pisot who gave him solutions to the questions that had appeared on the examination in prior years.

¹⁶See especially Jean-François Sirinelli's *Génération intellectuelle: Khâgneux et normaliens dans l'entre-deux-guerres* [82].



D'Orgeval, Lucie , and a companion.



D'Orgeval, André, and Lucie.

Figure 6: Paris, 1931 or 1932.

It is also notable that André never appears in d'Orgeval's accounts of his political activities. Robert Fortet and Daniel Dugué, mathematicians who would be André's colleagues at the University of Paris after the war, are mentioned as participants in his marches, but there is never any mention of André's political opinions. André was never interested in politics.

After the agrégation and the summer vacation of 1932, d'Orgeval was off to Iran, sent there by the French government to teach in Teheran's own Ecole Normale Supérieure. For André, it was time for military service.

Universal military service was a long tradition in republican France. The term of service was two years right after World War I, but in the 1920s the prospects for peace with the German Weimar Republic seemed good enough that the French reduced the size of their army and shortened the term of service to 18 months in 1924 and to 12 in 1928. It was not lengthened again until 1935. André's twelve-month service, deferred while he completed his study at the Ecole Normale, began on November 1, 1932, the beginning of the university's academic year. Like most normalians in mathematics, he spent the year training to be an officer in the artillery. We know little about his life during this period, but we know that peace-time military training was not a seven-day-a-week task. Part of his training was at Metz, near the German border, but he also spent time with the 401st anti-aircraft regiment, based at Fort Romainville, just outside the city limits of Paris to the northeast. He

could find time to continue his relationship with Lucie.

What would be his assignment for the following year, 1933–34? Would he teach in a lycée? This would impede his preparing a thesis, but it would provide a salary that would allow him to support a wife. If he did go to work preparing a thesis, would there be a scholarship for him? These were questions for the director of the Ecole Normale, Ernest Vessiot (1865–1952). Because André was not yet a lycée or university professor, he was still attached to the Ecole Normale, and one of Vessiot’s tasks was to seek support for normalians who had been authorized to prepare a thesis. Perhaps the normalian could work as an assistant in the school’s library or as an *agrégation-préparateur*. Or perhaps there could be a Commercy or Arconati-Visconti scholarship. Vessiot had studied at the same lycée in Marseille as André, but 45 years earlier; he had placed second to Hadamard in the competition to enter the Ecole Normale, and had become its director in 1927, after serving as deputy director since 1910. He would retire, at the mandatory age of 70, in 1935.

By June of 1933, Fréchet and Vessiot had concluded that André should go to the French Institute in Berlin, on whose board Vessiot sat. André did not like the idea; on June 20, wrote to Vessiot from Camp de Suippes, between Metz and Reims, to argue against it. His knowledge of German was inadequate, and he proposed going to Teheran instead (perhaps because d’Orgeval was there, or perhaps because he knew d’Orgeval had left a place open, returning to France to recuperate from typhoid) or spending a fourth year at the Ecole Normale in Paris. But on June 22, Vessiot wrote to the institute in Berlin recommending André. He would surely profit greatly from the stay there, Vessiot said, like Brelot and de Possel before him. No topic of research is specified in the letter.

During the 1932–33 academic year, René de Possel had stayed at the institute while working with Erhard Schmidt at the University of Berlin on integration in abstract spaces, obtaining results related to the product of two abstract spaces [32]. He was planning to return in 1933–34. Another normalian and future Bourbakist, Claude Chevalley (1909–1984), who had also already spent a couple of years in Germany, was considering joining him. But on 11 July 1933, de Possel wrote to the Institute’s director, Henri Jourdain, to say he would not be coming. Instead, he took a temporary teaching position at the University in Marseille. Like André, de Possel had been a student at the lycée in Marseille; he had entered the Ecole Normale in 1923. He was something of a free spirit. He had failed the agrégation the first time he took it, in 1926, but he passed in 1927 and was then awarded Arconati-Visconti scholarships for three years, from 1927 to 1930. During 1930–31 and 1931–1932, he had studied in Germany and Hungary as a Rockefeller scholar. Then he had spent the year in Berlin. Perhaps it was time to settle down and earn a better living. He had a child, and his marriage was breaking up.

On July 18, a week after de Possel had written to resign, André wrote to Jourdain announcing he would be coming:

I have the honor of being accepted as a fellow at the French Institute in Berlin, for the duration of the academic year 1933–34. I plan to start my thesis in mathematics during this year, under the direction of Mr. Erhardt Schmidt. I am now doing my military service, which I will finish around October 15; so I will leave November 1.¹⁷

But what would come of André's relationship with Lucie in Paris? On September 27, André wrote to Jourdain again, this time from Paris, from a hotel at *71, rue Monge*, in the Latin quarter a few steps from the Roman-era Lutèce arena. He apologizes for not yet having sent the exact date of his arrival in Berlin; he had not known exactly when his military service would end. He now plans to arrive on the 2nd or 3rd of November. Surprising news: he will be married in a couple weeks. He realizes that he will have to be an external fellow in Berlin. Fellows were housed and provided dinner at the institute, but those who were married had to find external housing.

On October 7, 1933, Jean André Ville and Lucie Georgette Ernoult were married in a civil ceremony at the town hall for Paris's 5th arrondissement – the Latin quarter. Director Jourdain may have been the only person forewarned of the marriage; André's and Lucie's families may have remained in the dark.

André and Director Jourdain exchanged further letters about finding a place for André and his wife, and on October 24, Jourdain wrote to offer some help. The Institute's rules made no provision for helping married fellows, but because André would not be eating his meals at the Institute, Jourdain would add 75 marks to his monthly stipend of 250 marks. Might André be interested in giving well paid lessons in mathematics, physics, and chemistry to prepare the children of a Polish diplomat for the baccalaureate?

It was Lucie who responded to the director's letter of October 24. Her letter is worth translating in full, for it is the only chance we will have to see this forceful woman through her own words.

Mr. Director,

Your letter of October 24 arrived in my husband's absence, and I ask you to please accept right away his most heartfelt thanks for your kindness and your quickness to help him.

As soon as he returns, my husband will confirm his agreement with the conditions you have proposed to him for the stay.

I can also assure you that he will be very happy to be able to give mathematics lessons, but I believe I should let you know

¹⁷The correspondence reported here is in Carton 1 of the archives of the Institut français de Berlin, which form part of the Archives of the French embassy in Berlin in the French diplomatic archives (Centres des Archives diplomatiques) at Nantes. The letters from André and Lucie are handwritten; those from Director Jourdain are carbon copies of typewritten letters.

that his knowledge of German will not permit him to undertake a conversation in German as soon as he arrives in Berlin.

I will accompany my husband, and I think he will set the date of his departure as Friday, November 3. He will be very grateful to you for addresses of bed-and-breakfasts and hotels that you could provide to him.

I again express to you, Mr. Director, my very heartfelt thanks for my husband and myself, and I ask you to accept the assurance of my most devoted salutations.

L. Ville

André was in Marseille, seeing his mother. In those days, you did not telephone Marseille from Paris to talk things over. Lucie was evidently capable of deciding how the director's letter should be answered.

What did André tell his mother about his marriage? On October 24, she records in her account book that she has given André 2500 francs for his trip to Berlin. On October 31, André writes to Director Jourdain from Marseille to say that he has been further delayed. He has fallen ill in Marseille, he says, and he still needs to sort out his passport in Paris.

On November 7, he and Lucie are finally in Berlin; he writes to Director Jourdain from the Pension Stinde on the Kurfürstendamm, a bed-and-breakfast Jourdain had recommended, to say that he will come by the Institute the next day.

6 Berlin, 1933–34

During the 1920s, there were French institutes in London, Rome, Madrid, Vienna, and twelve other European cities. Sponsored by the French foreign ministry, they offered courses in French, hosted public lectures and performances to advertise French culture, and often hosted visiting French students. But after the outbreak of World War I, there had been no French institute in Germany and no German counterpart in France. Only in 1930, five years after the Locarno meetings, did the two countries finally agree to open modest institutions for cultural exchange in their respective capitals. The German government opened a branch of its office for university exchanges in Paris, and the French foreign ministry opened a modest institute in Berlin.

Under pressure from right-wing German newspapers, the French agreed that their institute in Berlin would not offer courses or lectures to the German public. It would confine itself to housing French students who came to the German capital to learn about the glories of German culture and science. The French did often call it the *Institut français de Berlin*, but officially it was the French Academic house, *Maison académique à Berlin* in French, *Französisches Akademikerhaus* in German. This arrangement was sufficiently satisfactory to German pride that the institute continued to operate after

Hitler came to power in 1933; it closed only when Germany and France went to war in 1939.¹⁸

From 1930 to 1937, the institute was housed at 14–15 Landhausstraße, in what had been a large bourgeois home in the Wilmersdorf quarter in the southwest part of Berlin. This was near the scientific institutes in Dahlem – the part of Berlin’s university that grew into West Berlin’s Free University during the Cold War. There were enough rooms for seven or eight fellows and a few more temporary visitors. The director lived nearby. With a few married students also living nearby, there were between 8 and 11 fellows each year. The most successful fellows were encouraged to stay for a second year to pursue their projects; the institute’s board assumed that their first year would have sufficed only for them to perfect their German and get started.

Dominique Bosquelle has tallied the disciplines of the 25 fellows in the first three years, 1930–31, 1931–32, and 1932–33. There were five Germanists, four historian-geographers, three philosophers, three mathematicians, three physicists, two legal scholars, two students of literature, one linguist, one doctor, and one Indianist [18]. The picture was similar in 1933–34; André was a mathematician, but the ten other fellows were all humanists.¹⁹ Three were Germanists:

- Jean Jacques Anstett, author of *La Pensée religieuse de Friedrich Schlegel* (1941) and later professor at the University of Lyon [29].
- Roger Ayrault (1900–1985), who passed the agrégation in 1928. He studied German Romanticism.
- Eugène Susini, who entered the Ecole Normale in 1922 and passed the agrégation in 1928. Of Corsican origin, he was a practicing Catholic. He showed Sartre and Beauvoir homosexual dives in Berlin.

Three were historian-geographers:

- Henri Brunschwig (1904–1989), who passed the agrégation in 1930. He was particularly sensitive to the Germans’ anti-semitism but stayed in Berlin for four years. He became the dean of French colonial history.
- Philippe Dollinger (1904–1999), who passed the agrégation in 1931. He was a historian of the German middle ages.
- François Weymuller (1909–2001), who entered the Ecole Normale in 1927 and passed the agrégation in 1931. He became known as a historian of Mexico.

¹⁸See Bock [14] and Bosquelle [18]. Relevant archives are in the diplomatic archives in Nantes and in the National Archives in Paris: CARAN AJ/70/29, AJ/70/30, AJ/16/6945.

¹⁹The fellows for 1933–34 are listed in the archive at Nantes. The list also includes the name of the physicist Alexandre Proca (1897–1955), but the records of monthly payments suggest that he was there only in the summer, before André and Lucie arrived.

Two were philosophers:

- Raymond Lucien Klée (1907–1944), who passed the agrégation in 1931. He died in a German concentration camp at Struthof on 18 April 1944.
- Jean-Paul Sartre (1905–1980), who entered the Ecole Normale in 1924 and passed the agrégation in 1929.

One was a student of French literature, and one an economist:

- Jean E. Ehrhard, who passed the agrégation in 1928 and published *Le roman français depuis Marcel Proust* in 1932.
- Eugène Bongras, who became a professor of economics in Fribourg in Switzerland after the war.

Three of the ten – Sartre, Susini, and Weymuller – were normalians. Five of them – Ayrault, Bongras, Brunschwig, Dollinger, and Susini – were continuing from the previous year. André, 23 years old when he arrived, was substantially younger than most of them. In the humanities especially, even the most promising scholars might study several years for the agrégation and then teach in a lycée for several more before undertaking to write a thesis.

André and Fréchet were evidently relying on Erhard Schmidt to suggest a topic of research for André. In his conversation with Pierre Crépel fifty years later, André recalled that Fréchet had suggested that he work on problems involving two spaces, as de Possel had done under Schmidt’s guidance the year before. Perhaps he should look at an abstract space such as a Hilbert space, together with a more concrete space such as a space of sequences [33]. But 1933–34 was not a propitious time for a Frenchman to work with Schmidt. Hitler, who had become Chancellor in January 1933, was still ruthlessly consolidating his power, and German institutions, including the universities, were in turmoil. The French diplomats in charge of cultural exchange foresaw that things would settle down once the “German revolution”, as they called it, had run its course and the new authorities could do their jobs. But for now, exchange would be limited. André’s file in the archives at Nantes includes a carbon copy of a letter in German from Director Jourdain, dated 3 February 1934 and addressed to “den Herrn Direktor des Mathematischen Seminars der Universität Berlin”, probably meaning Schmidt, pleading for André to be allowed to attend the mathematics seminar. There is no reply in the file. Perhaps René de Possel had understood the situation in July 1933, when he had resigned his second year in Berlin.

In his encyclopedic survey of the attitudes and actions of German mathematicians during the Nazi period [78], Sanford Segal describes Erhard Schmidt as a conservative and nationalist but a decent man. In late 1938, Schmidt explained his support for Hitler to his Jewish friend and colleague Isaac Schur with these words (p. 358):



Figure 7: Lucie Ville a few days after her arrival in Berlin.

On November 12, 1933, German voters endorsed Hitler's withdrawal from the League of Nations and his single slate of candidates for the Reichstag.

The nearer banner reads, *Die Kriegsoffer fordern vom deutschen Volk das Ja!* (The war victims demand Yes from the German people).

The farther banner reads, *Mit Hitler gegen den Rüstungswahnsinn der Welt* (With Hitler against the world's armament madness).

Suppose we had to fight a war to rearm Germany, unite with Austria, liberate the Saar and the German part of Czechoslovakia. Such a war would have cost us half a million young men. But everybody would have admired our victorious leader. Now, Hitler has sacrificed half a million Jews and has achieved great things for Germany. I hope some day you will be recompensed, but I am still grateful to Hitler.

Later events disillusioned Schmidt and most of his fellow Germans. As Segal sees it, Schmidt gradually, if necessarily tacitly, changed his mind while maintaining his academic standing and reputation. He supported his Jewish colleagues as long as possible and blocked the advancement of mathematicians who tried to substitute Nazi credentials for mathematical achievement. He was still lecturing at the University of Berlin in 1946, at the age of 70 [51].

André had hoped that he would also be able to meet Richard von Mises in Berlin, and perhaps learn more about his foundations for probability. Von Mises (1883–1957), a professor of applied mathematics at the University of Berlin, had attracted wide interest with his program for defining probability as a limit of relative frequencies. But because of his Jewish ancestry, von Mises' position was untenable under Hitler, and he left for Turkey in November 1933, just as André and Lucie arrived in Berlin. Unable to find anyone who knew anything about the topics he had planned to pursue, André studied the work of the Greek mathematician Constantin Carathéodory, with whom de Possel had studied in Munich. He worked with privatdoctents, junior professors who made a living from fees paid directly by their students.

Fréchet expected André to be sending reports on his research that Borel could put in the *Comptes rendus*, and he wrote to scold when nothing was forthcoming. André's file in the diplomatic archives at Nantes includes a letter from Fréchet, dated June 14, 1934, to Director Jourdain asking that he convey an enclosed letter to André. André had not responded to his previous letter.

André's lack of success in his research was not his greatest heartbreak in Berlin. He had also to deal with Lucie's involvement with another man, the unprepossessing but charming philosopher Jean-Paul Sartre, who subsequently became famous for his existential novels.

In 1960, Sartre's lover and life-long intellectual soul mate Simone de Beauvoir published the second volume of her autobiography, *La force de l'âge* [6]. The book recounted the years from 1929, when she first met Sartre at the age of 21, through the German occupation of Paris from 1940 to 1944. In particular, it mentions her visit to Sartre in Berlin in February 1934 and her reaction to his affair with Lucie. Beauvoir disguised Lucie's identity slightly, calling her Marie Girard and her husband a philologist:²⁰

²⁰Translated from pp. 211–212. The book was also published in English, with the title *The Prime of Life*.

Sartre was happy at the Institute, where he rediscovered the liberty and in some measure the camaraderie that had made the Ecole Normale so dear to him. He also made one of those feminine friendships that were so important to him. One of the fellows, passionate for philology but completely indifferent to matters of love, had a wife whom everyone at the institute found charming. Marie Girard had long hung around the Latin quarter; at that time she had lived in cheap little hotels, where she sometimes shut herself up in her room for weeks, smoking and dreaming; she absolutely did not understand why she was on the earth; she lived from day to day, lost in a fog pierced by a few obstinate convictions; she did not believe in heartbreak or in the unhappiness of luxury and wealth; in her eyes the only true unhappiness was misery, hunger, and physical pain; as for happiness, the word had no meaning for her. She was pretty, smiled slowly with much grace; her thoughtful languor inspired a lively sympathy in Sartre, which she also felt for him; they agreed that their relationship could have no future, but the present was enough, and they saw each other a lot. I met her and liked her, without jealousy. This was indeed the first time a woman had counted for Sartre since he and I had known each other, and jealousy is not an emotion that I underestimate or cannot feel. But the incident did not take me by surprise or disturb the idea I had formed of our life, because Sartre had warned me from the outset that he would have adventures. I had accepted the principle, and I had no difficulty in accepting the reality. I knew how much Sartre was set on the project that governed his whole existence: knowing and expressing the world. I was certain of being so closely associated with this project that no episode in his life could stymie me.

Sartre and Beauvoir already had a world-wide literary reputation when *La force de l'âge* appeared, and the book helped make famous Beauvoir's vision of their relationship. Rejecting the hypocrisies of marriage, she insisted that a man and a woman could live as social and intellectual equals, openly indulging in other personal and sexual relationships while remaining committed to each other. Rebels against their bourgeois milieu in the 1930s, Beauvoir and Sartre became a model for similar rebels of the 1960s and 1970s.

The letters and dairies that appeared after the deaths of Sartre in 1980 and Beauvoir in 1986 painted a more complex and less rosy picture.²¹ Sartre and Beauvoir were indeed remarkably open to each other about their many

²¹In 1983, Sartre's lover and adopted daughter Arlette Elkaim Sartre published dairies Sartre had written as a soldier during World War II [73], and Beauvoir published letters he had written her and others [74, 75]. In 1990, Beauvoir's lover and adopted daughter Sylvie Le Bon de Beauvoir published Beauvoir's wartime diary [10] and letters she had written Sartre [8, 9].

other lovers. But this meant that their lovemaking to others was often deceitful. Their letters to each other often expressed disdain for their other lovers, and because many of these lovers had been their lycée students, the relationships sometimes appeared exploitative. In France [46], and eventually in the English-speaking world as well [34], these newly stark aspects of the picture disillusioned many intellectuals who had been fascinated by Beauvoir's utopia.

What role did Lucie play in the development of Sartre and Beauvoir's ways of dealing with their lovers? Beauvoir told Deirdre Bair, who interviewed her at length over the six years between Sartre's death and her own, that she was better able to take the affair with Lucie in stride because Sartre's strongest emotion throughout was the thrill of cuckolding Lucie's husband [2, p. 189]. Although everything Beauvoir said about Lucie must be taken with a large grain of salt, it is possible that Sartre did resent André. Sartre's hated step-father, an engineer, had futilely tried to make him a mathematician. Sartre was obsessed with his own ugliness; André was strikingly handsome. Sartre was a lycée professor; André, five years his junior, seemed to be on a fast track to a university position. Sartre detested the military and refused to be commissioned as an officer; André was a second lieutenant. For her part, Beauvoir had every reason to belittle Lucie and André. Beauvoir told Bair that letters she exchanged with Sartre in 1933–34 were full of sordid details of affairs and intrigues [2, p. 189]. The world has not seen these letters, but we can see how André and Lucie are mocked in later letters. Sartre had nicknamed Lucie the moon woman, perhaps in praise of her dreamy disposition and round face [2, p. 189]. The moon, Sartre once wrote, is pretty because it is round [7, pp. 308–309]. In his correspondence with Beauvoir, Lucie and André became, less affectionately, the moon people (*les lunaires*). André is sometimes called Blondie (*Blondinet*), perhaps to mock his dark Catalonian complexion.²²

Did Lucie's and André's unusual vulnerabilities help launch Sartre and Beauvoir's game? Lucie later confided to Beauvoir that her father had raped her [8, p. 184], and when Beauvoir relayed this to Sartre, he gleefully confirmed it, bragging that he had figured it out by himself in Berlin and that Lucie had only perfunctorily denied it [74, p. 361]. As for André, we have no way of knowing his strategies for coming to terms with his mother and the woman he had found in the Latin quarter. No human being can know

²²We find mention of Lucie or André on pp. 76, 86, 180–182, 184–186, 193, 195–196, 204, 212, 213–214, 220–221, 244, 281, 291, 308, 313, 314, 316, and 339–342 of Beauvoir's *Lettres à Sartre, 1930–1939* [8]; on pp. 47, 60, 92, 110, 126, 128, 186, 193, and 228 of her *Lettres à Sartre, 1940–1963* [9]; and on pp. 85–88, 189–191, 203, 232, 236, and 246 of her *Journal de Guerre, Septembre 1939–Janvier 1941* [10]; all published posthumously. They also appear on pp. 211–212, 276, 400, 467, and 613 of *La force de l'âge* [6], and pp. 334–335, 380–381, and 387–388 of her 1974 interview of Sartre [7]. On Sartre's side, Lucie and André appear only in posthumously published letters and journals: pp. 109, 152, 174–175, 176, 210, 357, 361, 379, and 480 of *Lettres au Castor et à quelques autres, 1926–1939* [74], and pp. 177 and 345 of *Les carnets de la drôle de guerre, Novembre 1939–Mars 1940* [73].

enough to say another is indifferent to love.

7 Vienna, 1934–35

Although he had failed to find a thesis topic in Berlin, and his dream of a doctorate may have been fading, André was still an *agrégé*, a civil servant under the ministry of education, for whom the appropriate employment was teaching in a lycée. He wrote from Berlin to ask for an assignment, and on August 14, 1934, he was offered a temporary post teaching mathematics in the lycée at Moulins, 300 kilometers south of Paris.

As it happened, Fréchet and Vessiot were not ready to give up on André. Fréchet, who made it a mission to keep in touch with mathematicians throughout the world, except perhaps those in Germany, had a correspondent in Vienna who might be the right mentor for him: Karl Menger. André was awarded an Arconati-Visconti scholarship of 13,000 francs so that he could spend the academic year 1934–35 in Vienna. The Marquise Marie Louise Arconati-Visconti (1840–1923) had left her entire fortune to the university for scholarships, and in the late 1920s and early 1930s, after the inflation following World War I had practically wiped out the value of the earlier Commercy bequest, the Arconati-Visconti endowment was the main source for doctoral scholarships. After consulting with Vessiot, André accepted the scholarship, and on August 22 he wrote to the ministry declining the post in Moulins.²³

Karl Menger (1902–1985) held only a junior post at the University of Vienna, but he was in touch with many new currents in mathematics, and he was keenly interested in the philosophical and logical foundations of mathematics and its applications. After earning his doctorate in mathematics at Vienna in 1924, Menger visited L. E. J. Brouwer in Amsterdam on a Rockefeller Foundation scholarship. After his habitation in Vienna in 1926, he plunged into the study of geometry, especially the theory of curves and dimension theory. He became close to Kurt Gödel in Moritz Schlick’s philosophical seminar, later remembered as the “Vienna Circle”. In 1930, he went on a lecture tour of the United States. By 1933, he was corresponding with Fréchet. For eight years, from 1928–29 through 1935–36, he conducted a remarkable mathematics seminar and published its proceedings as a journal, the *Ergebnisse eines Mathematischen Kolloquiums*.²⁴ Aside from Gödel, prominent participants included Nachman Aronszajn, Marston Morse, John von Neumann, Karl Popper, Albert Tarski, Abraham Wald, and Norbert Wiener. Students came from all parts of the world, including the United States, eastern Europe, and Japan, to spend a month, a semester, or a year. André was the first student from France.

²³National archives in Paris: CARAN F/17/27255.

²⁴In 1998, Springer reprinted the proceedings, along with several introductory articles in English, in a single volume [35].

Before André and Lucie left Paris for Vienna, it occurred to them that Vienna, too, had a French institute, and that they might be able to take advantage of it to live more cheaply there. Vessiot explained to André that the institute in Vienna was not able to help French students, but he and Lucie nevertheless went to the foreign affairs ministry to talk it over with Jean Marx (1884–1972), who was responsible for French institutes abroad. Marx confirmed that there were no facilities for French students in Vienna.²⁵

The first meeting of Menger’s seminar for the fall of 1934 was on November 11. On December 13, André wrote to Director Jourdain in Berlin to tell him how things were going:

Mr. Director,

We are happily enough installed in this charming city, which we still do not know very well – my wife has had to remain in the room for a some time since our arrival. She still does not dare go out.

Before leaving Paris, we were very pleasantly received by Mr. Marx, who explained to us why the Ministry of Foreign Affairs cannot do anything for us. You had already explained the reasons to us, and we had agreed with you, so we could only agree with Mr. Marx.

I am not in the privileged conditions that the House of France at Berlin offered, far from it, all the more so because there are no mathematics lessons for me to give. But on the other hand, I am finding incomparably more resources and possibilities for work in Vienna than in Berlin.

I ask you, Mr. Director, to agree to give my very respectful regards to Mrs. Jourdain, and to accept for your own part my expression of my most devoted sentiments.

A. Ville
Wien VIII
Skodagasse 28

In 1934–35, presentations were made in Menger’s seminar by Menger himself, Gödel, Popper, Tarski, and Wald, as well as by the lesser known mathematicians Frantz Alt, Leonard M. Blumenthal (from the United States), Eduard Čech, J. Groß, Tomoharu Hirano (from Tokyo), Josef Novák, György Alexits, and Friedrich Waismann. In addition to André, several other participants, including Blumenthal, Hirano, and Tarski, were in Vienna on scholarships from their home countries.

²⁵The National Archives in Paris (CARAN AJ/16/6945) contain a report, dated 6 January 1934, concerning the poor facilities and poor administration that hampered the Vienna institute. Little was happening there aside from the courses offered to the Viennese public by a couple bright young French agrégés.

Menger's brilliant student Abraham Wald (1902–1950) contributed to every topic in the seminar and was especially involved, during André's stay, with the mathematics of economics. Wald was a latecomer to the university. He had been born in Transylvania, where his father was an orthodox Jewish baker, and his family had come to Vienna after the Romanian annexation of the region during World War I. He had passed the examination for entrance to the university after attending an engineering school and being tutored by his brother in mathematics [63, 98]. He had defended a thesis in 1931, but his religion barred him from a university post of his own, and so he earned a living in Oskar Morgenstern's economics institute.

The proceedings for 1934–35 note three contributions by André: “Sur une proposition de M. L. M. Blumenthal” on 12 December 1934, “Bemerkung über vollständige Räume” on 13 March 1935, and “Ein Satz über quadratische Länge” on 12 June 1935. Written versions of the December and June presentations are included in the proceedings [83, 84]. Their author is “A. Ville”. He was not yet Jean Ville, even professionally.

Menger's seminar set the course for André's entire intellectual career. There were new ideas coming from every direction: mathematics freed from the stuffiness of the Paris tradition and the pedantry of Bourbaki. New ideas in logic and geometry, a new world of mathematical economics. As André told Pierre Crépel in 1984, Menger even gave him a way of understanding the sources of the rigidity of French mathematics. The problem, Menger said, lay in the pedantry of the lycée, so focused on training students to excel in the narrow set of problems and styles defined by the French national competitions [33].

The seminar directly inspired André's first and most important contribution to mathematics: his use of martingales to characterize random sequences. As André told Crépel, people were fascinated by the problem of defining randomness. Many authors had offered mathematical definitions. Even Fréchet was interested in von Mises' concept of a “Kollektiv” – a sequence of 0s and 1s, say, whose limiting relative frequency of 1s is unchanged when one selects a subsequence. André had been thinking about collectives before he went to Vienna, but it was Karl Popper who brought them into Menger's seminar. As Menger later explained [61], he had asked Popper to talk about collectives in his seminar after hearing him give a less technical talk about them in Moritz Schlick's seminar. Popper did so on 6 February 1935. Two weeks later, Wald presented the result that he later published in the Paris *Comptes rendus* [92] and at greater length in Menger's proceedings [93] and in the proceedings of the 1937 colloquium on the foundations of probability at Geneva [94]. Wald's main result was simple but influential: if we specify a countable number of rules for selecting subsequences and a desired limiting frequency, then there exists a sequence that has that limiting frequency and retains it on all the subsequences.

Menger's proceedings do not record André having presented his own ideas on collectives in the seminar, even though he told Crépel that they had been

well received in Vienna. Apparently he wrote them up only the following year, after his return to Paris.

The main point of André's critique of collectives was that von Mises' and Wald's idea of selecting subsequences was inadequate as a foundation for classical probability theory. It was inadequate for representing the classical idea of the futility of gambling systems, because a gambler can do more than choose trials on which to bet; he can also vary the amount and size of his bet. It was also inadequate for representing the classical idea of ruling out events of probability zero, because the relative frequency of 1s in a sequence of 0s and 1s can converge to a number p and yet do so in a way that has probability zero (it can converge to p from above, for example), and this behavior cannot be ruled out by specifying a countable number of subsequences on which the limiting frequency must also converge to p .

On the positive side, André showed that if the gambler is allowed to vary his bet, then the idea of the futility of gambling systems does match up with the idea of ruling out events of probability zero. For every event assigned probability zero in the classical theory, André showed that there exists a step-by-step strategy for betting that will never risk more than a fixed initial stake and yet makes the gambler infinitely rich if the event happens. Recalling the age-old name "martingale" for a gambling strategy that purports to guarantee great wealth, André gave this name to a strategy that allows a gambler to vary his bet on a sequence of events and also to the resulting capital process – the sequence of random variables representing the gambler's wealth at successive steps.

8 Back in France

On October 30, 1935, the eve of the new academic year, the French government created the *Caisse nationale de la recherche scientifique*, responsible for distributing scholarships, financing scientific laboratories, and even paying the pensions of retired scientists [71]. This first "CNRS" was an important milestone for scientific research in France, between the *sou des laboratoires*, the tax on industry for financing research that had been introduced by Emile Borel and his parliamentary allies when they were swept into power into 1924, and the creation in 1939 of today's CNRS, the *Centre national de la recherche scientifique*. The creation of the *Caisse nationale de la recherche scientifique* meant more funding for French researchers working on doctoral theses, and André Ville was one of the beneficiaries. For the three academic years after his return from Vienna, 1935–36 to 1937–38, he was paid 24,000 francs a year to do research. This was a substantial increase from his 13,000 franc scholarship in Vienna. It was more or less the salary of a beginning lycée professor.

According André's conversation with Pierre Crépel in 1984, he wrote up his results on collectives during his first year back in Paris, 1935–36. In

January of 1936, Wald sent a note on his results on collectives to Paris for the *Comptes rendus* [92], where it was customary to publish one or two page statements of results without proofs, and this opened the way for André to publish his own results in the *Comptes rendus*, examining the relation between Wald's collectives and the ideas of Popper and Reichenbach [85, 27 April 1936], and explaining his own version of collectives based on martingales [86, 6 July 1936]. (The author is now "Jean-André Ville".) Unfortunately, Fréchet had a hard time seeing the point of what André had done, and he certainly did not think it was enough for a thesis. There was logic in it. But where was the mathematics?

We do not know whether André brought Lucie along to meet to his mother when he was in Marseille and Mosset in the summer of 1934, between Berlin and Vienna. But according to d'Orgeval, who saw André and Lucie back in Paris, Lucie charmed Mosset after their return from Vienna. She conquered uncle Benjamin's heart in the summer of 1935 by singing with the local choir in Mosset's celebration of the vow of Louis XIII on August 15. The old man married them in a religious ceremony, something they had "forgotten" to have in Paris. Benjamin Vernet died on December 10, 1935. He is remembered today for the hospitality he extended in 1934 to the first refugees from fascism to arrive in the area, Pitt and Yvès Krüger, the German couple who turned a farm at La Coûme, a mile up the valley from Mosset, into a multinational orphanage for fellow refugees [3].

André was still hopelessly in love with Lucie, and remained so until the end of his life, but he confided to his godfather that he was not happy in his marriage. He and Lucie, he said, did not really live together in Paris – each had their own lives. D'Orgeval reported that they had taken a little modern apartment on the *rue de Navarre*, a block from the *rue Monge*, but André would still give 71, *rue Monge* as his address. According to Beauvoir and Sartre's letters, Lucie had had another passionate love affair in Vienna, and the same pattern continued back in Paris. The 24,000 francs from the CNRS was not enough for this life style, and during the academic year, Lucie worked for an agency that supplied usherettes to the Paris cinema. An usherette could take home as much as 1500 francs a week in the early weeks of a very successful film. Lucie worked the late shift, working from 5:30 pm to 9:30 pm, breaking for half an hour, and continuing from 10:00 pm to 2:00 am. Sometimes, though, she told d'Orgeval, she would trade places with a colleague on the early shift, from 2:00 to 5:30 and then 7:30 to 9:30, because the colleague wanted the extra income that could come from trysts arranged with customers in the wee hours.

9 Games, 1936–37

André's position as a researcher with the CNRS was renewed for the new academic year in the fall of 1936. He was not yet a laggard; the traditional

doctoral degree he was seeking, the *docteur ès sciences*, was not something a person was expected to prepare in two or three years. But how was he going to do what Fréchet would accept as a thesis in mathematics?

He tried his hand in an area that everyone recognized as proper mathematics for probability: limit theorems. In a note in the *Comptes rendus* for December 14, 1936 [87], he explains that the median of a sample of n observations will converge to the median of the probability distribution from which it is drawn as n grows, just as the mean converges to the expected value. The result is elementary, surprisingly so given that André cites Fréchet's forthcoming and already long-awaited treatise [40], which was to include an exposition of Glivenko's proof that the convergence is uniform. We are left to wonder whether André had read Fréchet's manuscript (or had merely assumed that he had already seen it all when he had studied for Fréchet's DES), and whether Fréchet saw André's note before Borel inserted it in the *Comptes rendus*. Unfortunately, the note attracted the anger of Lévy, who repeatedly complained about it to Fréchet [4, 59]. Lévy felt that other mathematicians had taken credit for many of his own insights, and he was galled to see a student added to the list. André wisely dropped the topic. The offending *Comptes rendus* note is never mentioned in the lists of publications he prepared during his later career. But Lévy never revised his opinion that André was no more than a good student, with little originality.

Fortunately, André had another assignment in 1936–37, which proved far more important to his career and gave him a patron far more powerful than Lévy: Emile Borel. From the very beginning of his career as a professor, long before turning to probability theory, Borel had made it a practice to have his students put his lectures into publishable form [49]. Fréchet, for example, had written up Borel's lectures on functions of real variables, published in 1905. In the 1936–37 academic year, Borel lectured on the theory of games, which he had pioneered in the 1920s, and André wrote the book. *Applications de la théorie des probabilités aux jeux de hasard* [17] was one of the final volumes of Borel's gigantesque *Traité du calcul des probabilités et de ses applications*, the first volumes of which had appeared in 1924. The title page of the book gives Borel as the author, but states that it has been written (*rédigé*) by Jean Ville. Professionally, he was finally “Jean” instead of “André”.

In retrospect, the most important part of the book is Jean Ville's own contribution, an appendix in which André generalized John von Neumann's minimax theorem and simplified its proof [88]. André's new proof made path breaking use of convex analysis. In the 1970s, when convex analysis looked much more important to economics than the fixed-point approach von Neumann had used, some mathematicians considered Jean Ville's proof of the minimax theorem “the beginning of the modern period in the applications of mathematics to economics” [45].

The minimax theorem was not yet well known in the 1930s, and André's new proof drew little immediate attention and only muted appreciation from his mentors. Borel, still smarting from von Neumann's having proven an

elegant theorem on a topic where he himself was offering only examples, appended a note of his own to André's, explaining why the theorem was not really important [17, pp. 115–117]. Fréchet was not convinced of the value of reproving a theorem. But this work would become the main source for Jean Ville's mathematical reputation during his lifetime. In 1953, in an otherwise impatient response to Fréchet's argument that Borel's work on games had been a significant anticipation of von Neumann's, von Neumann himself praised Ville's proof as path breaking [33, 43, 64], and this opened the way to his appointment to the Faculty of Sciences at the University of Paris in 1956.

Although he never took the minimax work seriously until von Neumann endorsed it, Fréchet had come to appreciate André's work on collectives by October 1937, when he invoked it at length in a famous debate on collectives with Wald at an international colloquium on probability held in Geneva [41]. André was not at the meeting. According to a letter to Fréchet from André's fellow doctoral student Wolfgang Doeblin, dated 16 September 1937 [21, letter 43, p. 20], André could not attend because he was busy writing up Borel's lectures. Doeblin went in his place.

André also had other things on his plate. One of them was the study of economics, which had fascinated him since he had seen Wald at work in Vienna. In the French university system, the place of economics was in the Faculty of Law. Students who entered the Faculty of Law after earning their baccalaureate in the lycée would spend two years earning a baccalaureate in law and then a third year earning a license. André had been following this program on the side since he had returned to Paris, and he completed the examinations to earn his baccalaureate in law in June 1937.²⁶

There were also adventures with Lucie, but Lucie was often away on her own. André's cousin Marie Argelès remembers that Lucie would spend time in Mosset, living in the Mosset house of her mother-in-law (who was usually in Marseille). Often enough, Lucie would drive over to the Argelès' house in Eus, down the valley to Catllar and then a couple more kilometers down the Têt. Marie did not like Lucie, who smoked at the table even when she was asked not to, and kept talking when there was work to do. The Argelès were fruit farmers, and Lucie wanted to know how everything was done. Finally, in 1937, Marie told Lucie not to come back again if she was not going to bring André. That was the last they saw of each other.

In the fall of 1937, Sartre was also back in the picture. Beauvoir and Sartre had not spent much time in Paris in 1935–36, when André and Lucie were first back from Vienna, but Beauvoir transferred from the lycée where she taught in Rouen to a lycée in Paris in the fall of 1936, and Sartre transferred to Neuilly, close enough that he could live in Paris, in the fall of 1937.

²⁶We know this because André included the information on a personnel form he completed in October 1938 (National Archives, CARAN F/17/27255). He also completed the license, but the date is uncertain; he gave the date 1939 in various documents prepared after the war, but d'Orgeval gives the date 1942 [66].

In September of 1937, by his own account, Sartre telephoned Lucie hoping she could lend him some money, and this led to a long chat with André and Lucie at the *Closerie des Lilas* on the *boulevard Montparnasse*. Sartre recounted it mockingly to Beauvoir: They wanted him to find someone who would take their furniture. Should they immigrate to the United States? Should they adopt a young Spanish girl Lucie had met in Mosset? Shortly afterwards, Sartre reports to Beauvoir that he has an appointment with Lucie; he had promised to see her because she had said she needed to see him [74, pp. 174–176].

10 Mathematics, 1937–38

By the fall of 1937, André was also taking notice of a companion in probability mathematics, one of the most worthy of the century: Wolfgang Doeblin. It was in Doeblin's company that he managed to add enough mathematics to his thesis for Fréchet to accept it.

In 1937–38, André and Wolfgang began a probability seminar in Paris. The theme was the foundations of probability; André presented his work, and Doeblin presented Kolmogorov's axioms. The German tradition of weekly or biweekly research seminars, where faculty and students matched wits on the topic of the day, had been little used by Paris mathematicians, with the notable but august exception of Jacques Hadamard at the Collège de France [60]. But Ville and Doeblin had two examples they could aspire to emulate: Menger's seminar in Vienna and the Gaston Julia's seminar at the Institut Henri Poincaré, where the Bourbaki group had been developing their ideas since 1933. Borel thought the seminar was a great idea and quickly took charge of it; André later called the takeover an *Anschluss* [33]. But the seminar outlived them all, enduring through the war, becoming the forum in which Robert Fortet and the other young Parisian probabilists kept abreast of developments abroad after the war [22], and continuing today as the seminar of the Probability Department of the University of Paris VI, the Pierre and Marie Curie University.

Wolfgang Doeblin was one of the sons of Alfred Döblin, famed for his novel *Alexanderplatz*. The family was Jewish; they had fled to Paris from Berlin. A brilliant mathematician, Wolfgang had neither the advantages nor the disadvantages his French colleagues had derived from their education. Under Menger's influence, André had come to see the French style of mathematics as pedantic, but he saw a different style in Doeblin. Doeblin proved in fact to be most creative French probabilist of his generation. He developed an amazing general theory of Markov chains, going far beyond the finite or denumerable case, and he pushed the probability limit theorems, particularly with respect to domains of attraction, to a point that has never been surpassed or even properly understood. Like Fréchet, and unlike André and Lévy, he read everything, and unlike Fréchet, he absorbed it quickly. He was

the only French probabilist of the 1930s who was a relentless professional in the mold of the German mathematicians or of Americans such as Joseph Doob. In comparison, André, like Borel, remained a dilettante, who read on the diagonal whatever fell in his hands, and hastened to develop his own thoughts (always original) without any interest in taking into account what others had done. Doeblin's best work was left sealed for more than fifty years after his suicide on 21 June 1940, when capture by the Nazis had become inevitable [21, 26, 27, 56, 70].

In the seminar with Doeblin, André completed his thesis, adding Chapter V, where he applies martingales to prove theorems in probability, and even attempts to make the theory work in continuous time, attracting the attention of Doob and launching the theory of martingales that now counts for so much in probability [54]. André's *Comptes rendus* note on continuous-time martingales is dated 28 March 1938 [88]. On May 9, 1938, André wrote to Vessiot, saying that his thesis was ready to print, and asking him to ask the minister of education to assign him to an appropriate post. He pleads for an assignment close to the capital. He would like to continue serving, as he had in 1937–38, as the secretary for Borel's colloquium on the probability calculus.²⁷

11 Nantes, 1938–39

André was assigned by the Ministry of Education to the Lycée Clemenceau in Nantes, near the Atlantic, 460 kilometers from Paris. Nantes is a beautiful city. It was a great slaving port in the eighteenth century. The Loire has silted up, and now Saint-Nazaire is the port, but beautiful architecture and elegant living remain as the heritage of the slaving wealth.

André was now a lycée professor. He had 21 students and 17 hours of class a week, from 8 am Monday to 10 am Saturday. He taught the first of the two years of mathematical preparation for the competitions for the grandes écoles – the year then called *mathématiques spéciales préparatoires*. He was also responsible for his students' military training. His salary was 2600 francs, only a little more than he had been paid by the CNRS. He earned a little extra by teaching at the local polytechnique; such is the French system. In Nantes, he stayed at *23 rue Monfoulon*; he still gave his as Paris address the hotel at *71, rue Monge*, as his summer address Mosset.

When he presented his credentials at Nantes in November 1938, André explained not only that his thesis was ready to defend but that the version of it that would appear as a book, the fourth volume in Emile Borel's series of monographs on probability, was in press. Yet the defense was still being delayed, perhaps because of difficulties getting the thesis printed cheaply,²⁸ perhaps because Fréchet could still not bring himself to schedule the defense.

²⁷National archives in Paris: CARAN F/17/27255.

²⁸Ville alludes to this in the preface of the thesis and in his conversation with Crépel.

On Wednesday, March 8, 1939, André's teaching was observed by the inspector of lycées. The inspector found that André was appreciated by his students and his local supervisors, but that he sometimes let his words get ahead of his thinking, and he did not cover every point. He needed to establish a collaboration with his students that was not quite there yet. These were sins of youth. He would become an excellent lycée professor if he stayed in the job for a while.

This next day, March 9, André defended his thesis in Paris. With a nudge from Borel, Fréchet had relented. Fréchet's report praised even the philosophical chapters that André had added to make the thesis into a book for Borel. Borel, in his report as president of the jury, declared that André would soon have a position in higher education, and on March 16, he wrote to the ministry to recommend André's inscription on the *liste d'aptitude* for such positions. On July 6, Beauvoir wrote to Sartre that the moon man's thesis had come in the mail, with a gracious dedication [8, p. 76].

The thesis was Jean Ville's most enduring work. But there was no more time for collectives. Everyone knew war was coming. France mobilized its army on September 1 and declared war on Germany on September 3.

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