Mark Machina

Distinguished Professor, Emeritus

Presented to Mark Machina on his 66$^{\text{th}}$ birthday, October 27, 2020, in honor of his retirement. Edited by Uzi Segal and Joel Sobel with contributions from a selected set of Mark's admirers.

Machina's Magic

Mohammed Abdellaoui

I met Mark Machina for the first time at the 1986 FUR conference in Aix-en-Provence (France) while I was a first year PhD student. Mark's (famous) exchanges with Maurice Allais on the possibility of finding an alternative to the standard model of rational choice under uncertainty and related issues (e.g., local utility) definitely convinced the young researcher I was that this field of research was very stimulating and promising. Mark's intellectual elegance and the power of his arguments did not leave (me) indifferent. This is something I never forget.

A few years later, I had the chance to work at the Ecole Normale Supérieure de Cachan when Mark visited the department of Economics on a regular basis (after FUR 1992). During his visits to Cachan he always willingly interacted with me and other colleagues, and answered questions about his papers or general issues in Decision Theory. I learned considerably from his papers both in substance and form. Like many colleagues in our field of research, I like the style with which Mark presents his opinions (including about theories with which he does not necessarily agree). I also confess that I systematically ask my Ph.D. students to study in depth his excellent papers on probabilistic sophistication.

For me, and many other researchers, Mark's presence / participation at Decision Theory conferences (like FUR) always had something magical; so interesting were his discussions and talks. He is one of a handful of top researchers who have impacted and accompanied the most significant advances in research on individual decision making under uncertainty in economics.

Thank you, Mark, for all what you did for our field, and Happy Birthday!

Machina the Economist

Chris Chambers

Mark's work influenced me from the very beginning, his 1982 paper was the very first theory piece I read in graduate school. So it was a huge honor to get to work alongside him as a colleague.

Mark never stopped emphasizing the fact that we are economists. He appreciated the mathematics behind the results, but this clearly was not his main interest. Instead, he would get excited over pure economics. I was in the audience once when the top-trading cycle algorithm was being discussed (I forget by who), and Mark hadn't seen it before. It's impossible to forget how excited he was, he described it as the generalization of gains from trade, and I can remember him talking about it for the next week.

Mark has an amazing ability to focus on a problem, picking it apart and looking at it from as many different directions as possible. And this focus lasts over days, weeks, months. I can remember multiple occasions going to talk to him, one day he had one perspective on something he had been thinking about. Two months later he would still be thinking about the same problem, but claimed to have understood it better. He would then proceed to show me something which, to all appearances, hardly resembled our first discussion. The basic structure of the decision-theoretic problem under consideration was the same, but he always had some new understanding of what was going on. This kept going on until he finally decided he had understood the core underlying issues.

Mark is both persistent and insistent. I can recall one RUD or D-TEA where somebody had presented a paper involving non-testable ideas. And Mark would not let it go. That entire lunch, the entire coffee break, Mark insisted to this speaker the same point, that economic data have to be observable and that a non-testable model is not scientific. And he did this in as many ways as he possibly could have. I haven't seen that speaker at a decision theory conference since, but I do believe he learned something from the exchange.

Finally, I should mention Mark's sense of humor. Once when he was discussing whether trigonometry should be a prerequisite for some course, he asked if the students needed to get a form signed and co-signed. Jokes were a frequent and much appreciated part of interaction with Mark, even if the

jokes weren't always obviously hilarious.

I hope that Mark considers this a retirement in name only, and that he remains active in the profession for years to come. He is one of the greats. With any luck I'll see him in Paris one day if this covid thing ever ends.

Unforgettable

Alain Chateauneuf

Warm thanks to you, Mark, for those so many intellectual pleasures that you offered to us during all these years.

It is impossible to forget those famous FUR conferences where your debates with Maurice Allais were one of the best moments that we were all looking forward to.

It is impossible to forget your fantastic paper "Expected Utility Analysis without the Independence Axiom."

It is impossible to forget your so subtle "Dynamic Consistency and Non-expected Utility Models of Choice Under Uncertainty," which helped me to understand this delicate topic and to teach it to my students.

Michèle told you that your Mom should be proud to have such a great son! I agree with her and know your mother can still hear your warm, modest, and distinctive laughter that we know so well.

Machina

Chris Chatfield

M	is for the M&Ms he threw us when we got the answer right in micro class
A	is for the Slutsky equation allegedly tattooed upon his a**
C	is for his cost per unit mnemonic I remembered! It is very easy math
H	is for his serious-looking humor causing me to think before I laugh
I	is for his inquisitive library visits in the days of Gopher on the screen
N	is for his nifty photographs of staffers including those otherwise unseen
A	is for all these years as an influential and positive presence
	integral to the department's congenial soul and effervescence

Wishing you every happiness in retirement, Mark!

♡

My Stories about Mark

Xiaohong Chen

As a student of Mark since Spring 1987, I had observed/experienced Mark's many amazing characteristics. Mark is brilliant, energetic, quick, humorous, workaholic, perfectionist, stubborn, competitive, kind, and generous. Mark's love for research and teaching was extremely contagious.

While most people know his brilliance as a scholar and teacher, I would like to share several of my personal experiences of his generosity and caring for his students.

1. Mark, Shelley, and Roger taught me and others at the "Gregory Chow's Ford Economic Training Program" in Beijing from Fall 1986 to Spring 1987. When Roger taught macro and Shelley taught micro in Fall 1986, I found both subjects equally interesting. Then Mark taught a very exciting and beautiful micro theory course in Spring 1987, which got me really interested in micro and found the second semester macro boring. I received a strange letter one day, and asked Mark what it was about. Mark said congratulations that you got admitted to University of Western Ontario (UWO), and that was the first time I heard of UWO. Later on Mark found out that Roger had recommended me to UWO when he was giving a seminar there in early 1987, and they sent me an acceptance letter without my application or TOFEL score! Mark gave me his phone number and said that I could make collect calls to him from UWO/ Canada whenever I needed help. Mark also helped many of my fellow classmates from the Ford training program. In fact, Mark enjoyed teaching my class so much that he taught many more Ford training programs in China since then.

2. I did not get my Visa till the end of October 1987. It was already very cold when I finally arrived in UWO with about 25 Canadian dollars in my pocket (my parents had to borrow money to buy me an air ticket to Toronto). I could not find any place to live near the campus, and rented a tiny room in a basement that is far but still within walking distance from the campus, without heating, refrigerator, window; one piece of wood is the bed and a smaller piece of wood is the desk, with a cloth curtain as the door to the room. It was too cold for me to sleep in the evenings, and I used to fall asleep during lectures in the

well-heated classrooms. Then I made a collect phone call to Mark. Mark immediately encouraged me to apply to UCSD and to feel free to make more collect calls. My classmates at UWO were very surprised that I was making collect phone calls to a professor at UCSD as the international collect calls were expensive back then.

3. When I arrived in San Diego, Mark picked me up from the airport, gave me a brand-new bicycle, and drove me to the graduate student's apartment that he and Pu Shen (another graduate student) had found for me that summer. Mark even drove me and Pu to several tourist attractions including the wild animal park in San Diego to make sure that I fell in love with San Diego. In Winter 1989, I woke up late for my first day's TA job for Mark's undergrad micro theory course. I tried to speed up when I was biking to school without wearing a helmet, then got hit by a car with severe head injury and concussion. Mark visited me in the hospital later on and offered to buy me a new bicycle and a helmet. I replied thanks but I no longer want to ride a bike anymore.

4. During my first year at UCSD, I noticed that everybody else was called by his/her first name, but the professors and administrative assistants call me "Chen" instead. I finally asked one friendly administrator why she and others call me by my family name, not my first name. She replied that Mark told everybody to call me "Chen" even before I arrived at UCSD. I bet that Mark still calls me "Chen." During my second year at UCSD, Mark insisted that I drop out of all other courses and just do independent studies under his supervision. We ended up arguing a lot during our meetings. Mark was already one of the top decision theorists and was an associate editor of 8 or 9 journals at that time, and hence had perfect reason to be stubborn in his view of what is good and bad in a paper. I was clueless at that time, but equally stubborn. Mark must have treated graduate students as his friends, as I recall that he was not upset with my disagreement during one meeting before Thanksgiving, and even offered Pu and me a ride to Price Club for shopping after the meeting. I guess I must have picked up Mark's critical thinking and desire for perfection during those independent studies. As years later, most of my coauthors are upset with me being too critical of our joint papers.

5. What impressed me the most was Mark's love for his research and

teaching, his drive to be perfect and take pride in whatever he is doing, and his kindness and forgiveness towards his students. He was not upset and was still fine to be on my thesis committee after I switched from micro theory to econometrics. I am forever grateful to Mark for all his help and guidance. Nowadays I constantly remind myself what I did to Mark when some of my students argued with me or switched to other professors. I admit that I am nowhere close to the level of Mark's kindness. Perhaps it was Mark's true love and enjoyments in things he cares the most that he can forget and forgive the annoying things life throws at him.

6. Mark is a true decision theorist and makes wise decisions, including his best timing to retire from his long distinguished teaching career and to start a new exciting second act in his energetic life.

Congratulations and Best Wishes to Mark !!!

Visiting the Vatican

Chew Soo Hong

After FUR II in Venice in the summer of 1984, Mark Machina, Edi Karni and I shared a rental car for some sightseeing on our way to Rome. Arriving at our hotel near the airport the day before our flights to US, we could still go into town after dinner. The thought of driving by the Vatican came to mind naturally. To our surprise, Mark would rather remain in the hotel mentioning his need to catch an early flight the next day. When Edi and I arrived at awe-inspiring St Peter's Square, we noticed that one of the curved corridors appeared accessible by driving our tiny rented car up its steps. On an impulse, I did that. We soon found ourselves tailed by the Vatican police in a seemingly tiny car with flashing lights. Thank goodness we merely received a warning after coming down from the other end of the corridor.

Back at the hotel, I thought it'd be such a shame for Mark to miss seeing the Vatican for the first time. After all, it was a mere 30-minute drive from the hotel. After some persuasion, I managed to convince Mark to do a drive-by with me in the early morning. We started our journey at around 6 AM. Despite my best efforts (bounded by my innate lack of navigational sense), we found ourselves circling the Vatican from a distance but not converging. As we got past 8 AM, we could see that the notorious Rome morning traffic was building up and the air was becoming dense with anxiety. At some point, Mark thanked me for the valiant attempt and explained politely that he preferred heading back immediately rather than continuing to experience the uncertain prospect of a drive-by visit to the Vatican.

On our way back, I asked Mark out of curiosity when was his departure which turned out to be around 3 PM. I was visibly puzzled, thinking that there was ample time for us to make additional attempts. True to his form, Mark elaborated further with an observation about himself which may be viewed as a precursor to maxmin EU thinking, "I am infinitely risk averse." ☺

Some words about Mark

Michèle Cohen

I am sure that all of our colleagues will speak about Mark's outstanding qualities as a pure researcher: His creativity and his tenacity to obtain **fundamental** results on decision making — whether it be under Risk under Uncertainty or over Time — have made him a real **star** of the domain.

In this short message, I would like to focus on his outstanding human qualities.

First, his kindness: During the long years where we were attending the same conferences, I was always touched when, every time there was no question after a lecture, he always found an interesting question to ask out of respect for the lecturer. This was not always easy. . .

Then, his gift for pedagogy and exposition: in all his lectures, he always gives illuminating examples that make very complex results understandable and memorable. For that, he doesn't hesitate to use jokes, humor or examples, some of them becoming classic in the field, such as "Marschak-Machina Triangle" or "Machina's Mom"!!

I would like also to speak about his capacity to be happily surprised and amazed by all the new places he visited or events in which he participated. I will tell just one anecdote to illustrate this quality: He was in France, for a sabbatical year, in 1998. One evening of July, he went out for a walk; he mentioned to me how surprised and amazed he was by an event in which he participated, watching about one million people in the streets standing and going up and down for a long time. The French people were celebrating the victory in the Football World Championship by doing a huge "Ola" that he had never heard about. . .

Finally, I want to mention his total loyalty to friends and also his courage in the face of difficulties without ever complaining.

To conclude, I would say that Mark is an exceptional human being and I think that all his students have been very lucky to have him as a mentor.

Getting to Know Mark

Bernard Cornet

I realize that I have been knowing Mark for many years without being so sure when we first meet, as if I have always known him. But I am sure that, after reading this short text, he will remind me exactly when we met.

However I still have a fresh memory about when I met Mark the first time in Paris. Mark had been invited at the Centre d'Economie de la Sorbonne by Alain Chateauneuf and Michèle Cohen for a research stay in Paris and was scheduled to give a talk. Michèle and Alain were so enthusiastic and so laudatory about his coming and his talk, that I definitely wanted to listen to his talk and meet him in person. It happened that Mark's performance has been way above all expectations, but I discovered later that he was only doing business as usual.

I should say that Mark has a unique way to present a complex subject in a simple way that attracts and keeps the attention even of nonspecialists during the whole talk. In a few words, the talk makes the audience more intelligent than before, which is indeed very rewarding. His talk revealed a new scientific universe, and I was so glad to contemplate the sky, with stars being Mark, Maurice, and David, among others.

His stay in Paris has been the start of a long friendship that allowed us to discover different avenues in complement with our mutual interests in science. Mark has so many interests in life that spending time with him is always enriching. I like talking with him about science, art, travels, cuisine, politics, and many subjects from everyday life, including succulents. We can do it in a static way or a dynamic way. We can sit together at the terrace of a cafe or enjoy a restaurant meal, in Paris, Lawrence, or San Diego. We can also walk in museums, one of his favorite one being the Musée de Cluny in Paris, and there I realized that he knew most of the flowers of the thousand flowers tapestry. We can also walk in San Diego and watch the seals relaxing on the beach. There he will talk about the Gilboa-Schmeidler model of expected utility and its application to finance. Or maybe it was when we were going to the San Diego Zoo to watch the pandas because I told him that I had never seen pandas before. The first time we went to the Zoo, when the pandas were sleeping, was a disappointment. Thus we had to go back during my second visit in San Diego, but then there were no longer pandas in the zoo. But we understood that the real purpose of the visit was not to see the

11

pandas, but walk and spend some time together and talk about science and life.

Sorry to share a secret here, but did you know that Mark likes to party? And he likes to be dressed in very special clothes, to party with very special people. This story would be more fun if I can show you the photo that I have on a special event that Mark loved to attend every year in Paris. Each year we organize in Paris a special party for the graduation ceremony of our students and for this occasion we put on robes (the special clothes). Then we take photos on the terrace of the Centre d'Economie de la Sorbonne. In one photo we find Mark, with Ed Prescott and Nicholas Yannelis (the special people) and in the back we can see the Pantheon. I know how much Mark likes this photo because he showed it during the celebration of my 65th birthday.

Today I want to return the compliment for the special event organized for him. By the way, if you look at the photo, and others of him, you will always see him happy. This is part of his personality a state of mind about life and I wish him to keep smiling even after retirement

Mark, I wanted to let you know that meeting you has been a rare privilege,

walking with you in museums and zoos, seating in the terrace of a cafe in Paris or elsewhere, has always be a pleasure. We will forget soon the social distance we have during the outbreak and be back to normal life so that I can enjoy having you again as a friend in person

The Machina Measure of Risk Aversion

Eddie Dekel

It's a delight and an honor to write about my connection with Mark. My strongest memories come from the very first time I met him in person, when I flew to UCSD for the junior job market. For someone with as poor a memory as mine, I remember surprisingly many details, including his aversion to breaking the binding of a book and his humongous coffee mug. This just goes to show the impact he had on me. Most significantly, I can blame Mark for my arriving at airports at the last minute. After enjoying a wonderful visit Mark was so kind as to drive me to the airport. He insisted on departing well in advance, due to his well-known risk aversion. We arrived with ample time to spare, and, as these were the days before security restrictions, went to sit at the gate together. We talked and were having a great time until one of us — I can't remember who — noticed that everyone had disappeared. As you surely guessed, the plane had departed while we were engrossed in conversation. Nowadays, when someone encourages me to go to the airport early — or even on time! — I know that then I'll have a few minutes to get involved in something and might miss the flight.

Thanks, Mark, for this invaluable lesson!

On the MM triangle

David Dillenberger

I was never good in geometry and was never obsessed with triangles, till … I met Mark. He made me look at triangles differently. For most of my early career, my whole world lies within a right-angle triangle with hypotenuse of length $\sqrt{2}$ and I saw everything through its lens. When I gave talks in Northwestern I made sure to say that "northwestern is better" since this is the direction of increasing preferences. When I derived the "steepest middle slope" property in one of my papers I felt it is obvious with respect to what axes 'steepest' is defined. And all indifference curves I could imagine were now upward, rather than downward, slopping. Any intuition using equilateral triangles instead was bound to fail; this is left for the cooperative game theorists…

Honoring Mark Machina

Jürgen Eichberger

It is a great honor for every decision theorist to be invited to contribute to an "album amicorum" in honor of Mark Machina. He has been and still is one of the leading scholars in decision making under uncertainty from the 1980's onward when the discipline departed from the ruling paradigm of expected utility theory. From its beginning, Mark has been an essential researcher in this newly emerging field, influencing the direction it took and leading the rapid growth of it.

When I think of Mark two images spring to my mind: an eminent scholar with a great tolerance for the often naive questions of younger people and a friendly person, full of stories, with a broad interest also in non-academic matters.

I remember first learning about Mark's fundamental contribution to an extended Expected Utility Theory (Machina, 1982) as a young visiting assistant professor in Canada. I took note of this article as a generalization of expected utility theory, but it took me years to understand and appreciate its importance. Fifteen years later, when I attended a RUD meeting in Paris, I first met Mark at breakfast in an inexpensive hotel in the Quartier Latin. At that time, I was thinking about simple capacities and their applications to game-theoretic problems. Once again, I was struggling with one of Mark's important papers (Machina and Schmeidler, 1992). This time, however, I had the opportunity to ask for his opinion regarding my confused understanding of the notion of probabilistic sophistication. On the way to the conference venue, I raised the issue of the rationality of a decision maker considering not just the expected probability of the lottery induced by an act but worrying also about bad outcomes in a particular zero-probability event. To my surprise, Mark took my question very seriously. As I remember the conversation, he pointed out to me the tension between a normative approach where one should not consider events which one models as impossible and a descriptive approach where actual decision makers may evaluate acts differently although they induce the same lottery over outcomes if one of the acts has a particularly negative outcome on a zero-probability event.

Over the next twenty years, we would meet almost every year in or near Paris at RUD or other conferences. Moreover, I invited him to give a seminar at the University of Heidelberg. This visit gave me the opportunity to

introduce my Ph.D. students to him. Again, it was not only the awe of the great scholar that impressed my students but his kind and sincere interest in their ideas. Mark would not just share his thoughts with them but also his enthusiasm for the field and its developments.

On a more personal note, two events remain in my memory. Mark's story of Daniel Ellsberg and his love of movies. I knew about the Daniel Ellsberg of the Pentagon Papers long before I studied economics. So, when I learned about the Ellsberg paradox in decision theory, it did not even cross my mind to connect these two Ellsbergs. On a shared taxi ride down Boulevard St. Michel, Mark told me that there was just one Daniel Ellsberg, whom he knew from seminars at Berkeley. Moreover, Mark did reveal to me also a second Mark Machina by showing me a rebellious long-haired student of the riotous seventies on the then thirty-year old photo of his driver license.

Much later, at a summer school where the evenings offered plenty of time for conversations, I recall us in company with others talking about our preferred movies. The surprising thing was not that we shared a mutual admiration for some movies but how long it took us to find out that we were speaking about the same movies. We had to retell the plot of the movies before realizing that, in Germany, for example, Woody Allan's "Annie Hall" is called "Der Stadtneurotiker" or that Louis Malle's "Elevator to the Gallows" was distributed as "Fahrstuhl zum Schafott."

I would like to conclude these remarks with thanking Mark for sharing his thoughts with me over the years and for becoming the mentor of many of my students. I know they do remember him as a great scholar, but also as a very generous and supportive person.

References

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Mark's Greatest Achievement

Itzhak Gilboa

This must have been 30 years ago. Mark was presenting a paper at a conference; Peter Fishburn was in the audience. I was sitting in the back and could see both of my heroes. Mark started from Savage's theorem. He had the axioms on a slide, and explained them one by one. It was wonderful. Mark made everyone understand what the axioms were, and how great the theorem was. There was a feeling of exhilaration in the audience. Then Mark took a step back to say, "And I really think that this is one of the greatest achievements in the literature." From my vantage point I could see Peter Fishburn nodding excitedly as Mark added, "I mean, to put all these axioms on one slide." To me this anecdote summarizes so much about Mark. His dazzling brilliance, his ability to see through thickets of math, and his delightful sense of humor. Always caring about both research and the audience, always in a great mood, throughout his career he has been a source of inspiration and motivation for so many of us. Mark, we're very glad you'll have more free time, and we all hope to see more of you and of your research!

Adventures with Machina's Mom

Simon Grant

With the exception of my Ph.D. supervisor, Jerry Green, I can think of no one who has had a more profound impact on my research interests than Mark. It was July 1990, my co-author, Ben Polak, and I had undertaken a scenic but arduous fifteen hour drive from Boston to Durham, North Carolina, to present our first research paper at the Foundations of Utility and Risk (FUR) Conference, being hosted by Duke University. This was the first time this seminal interdisciplinary meeting for decision theorists had been held outside Europe. (As an aside, when my other co-author, Atsushi Kajii, looked at the map, he expressed his disbelief that we were seriously contemplating such a long drive and promptly booked himself a seat for what he viewed as the much more sensible option of a two-hour flight.)

Mark had starred at all three previous meetings, so it was no surprise that for his plenary lecture, the auditorium was packed (literally) to the rafters with an eager audience keenly anticipating what would no doubt prove to be both an enlightening and entertaining talk. The paper he presented, joint with David Schmeidler, was entitled "A More Robust Definition of Subjective Probability." As the title suggested, he and David were investigating a key foundational question at the heart of decision-theory (and of statistics), "When can an individual's choices over uncertain economic prospects be said to be consistent with classical probability theory?" Or as they rephrased it, when can behavior be viewed as probabilistically sophisticated. Of course, Ramsey, Anscombe-Aumann and Savage had provided answers, but all of their approaches entailed the decision-maker's risk preferences having to conform to expected utility. So Mark and David's had set their sights on "liberating" the theory of subjective probability from the expected utility hypothesis and this they achieved by characterizing what they dubbed a probabilistically sophisticated non-expected utility maximizer!

I realize my account of this pathbreaking lecture by Mark fails to capture how exciting and entertaining it was to listen to Mark in full swing. He is the consummate performer with exquisite comic timing. It still makes me chuckle to think back where at one point in his presentation, he paused, turned around and with his back to the audience, looked up at the slide on the large screen which had all seven of Savage's axioms on it and professed, "You have to admire the technical achievement!" But then, when he turned back and

saw everyone in the auditorium nodding reverently in agreement, that indeed Savage's theory represented an extraordinary achievement, the expression on his face rapidly turned to one of extreme frustration as he barked, "I'm not talking about the content of his axioms, it's getting them all one slide is the real technical feat!"

So what has this all to do with Machina's Mom? Well, although Mark and David's probabilistically sophisticated non-expected utility maximizers had been liberated from the confines of the expected utility hypothesis, her risk preferences still had to agree with the partial ordering of (first-order) stochastic dominance. Uzi, in his contribution for this collection, also mentions the story of Machina's Mom. Although Mark's purpose in that story was to illustrate issues pertaining to dynamic consistency, the fact that initially Mom is indifferent between giving the indivisible treat to either of her children, Abi or Benjie, but that she strictly prefers a fifty-fifty lottery (say by flipping a fair coin) to determine which of them gets the treat, is an example of a decision-maker's whose risk preferences violate stochastic dominance! Mulling over this on the fifteen hour car ride back to Boston led me to think surely there must be a way for Machina's Mom to be probabilistically sophisticated! This became the genesis for the third chapter in my thesis.

Not only was that chapter inspired by Mark's FUR presentation as well as his insightful and inspirational 1989 *Journal of Economic Literature* piece "Dynamic Consistency and Non-Expected Utility Models of Choice Under Uncertainty," but Mark was exceedingly generous with his time and help by providing me with many useful suggestions and comments through many iterations of the paper. And finally, Mark was pivotal in enabling me to retain the title that mentioned his Mom. Even after all the final changes requested by referees had been made and the editor handling the paper was ready for it to go to the publishers, one referee still felt it was inappropriate for a "scientific paper" to have such a "flippant" title as the one I had proposed: "Subjective Probability Without Monotonicity: or How Machina's Mom May Also be Probabilistically Sophisticated." So as to appease this referee, the handling editor suggested I contact Mark and ask for his permission to mention his Mom in the title. Unsurprisingly, he gave his consent but on one condition, I had to send him three offprints of the published article: one for him, one for his mother and one for his grandmother!

Encouragement

Yoram Halevy

It was early in the summer of 2000 and I was dragging my suitcase uphill to the site of the RUD workshop. This was an intimate but critical conference. In the previous year (which had senior researchers discussing the research of young faculty members), I presented my job market paper — and felt completely tarnished by a very unsympathetic discussant. A couple of seniors were encouraging ex-post, but the damage was done and I felt like an outcast even before joining the group. Returning to the same workshop (even if not to present), was not an easy decision.

Suddenly, I heard someone call my name. He was older (hence senior ...), and very nice. He introduced himself as Mark and was very friendly. He knew me from last year, but I didn't recognize him (I knew the name of course). For some reason I decided to disclose my fears. I knew very few people professionally, had no network, and was hired at UBC who had a tradition of towering faculty in theory like Diewert, Blackorby, Weymark, and others. I was not optimistic about the future.

Within the 15 minutes climb from the train station to the hotel, Mark was able to completely change my attitude. He reminded me that I didn't know my senior colleagues when they were young, and suggested that although my initial experience at RUD was not pleasant, people actually thought my work was interesting and it could be a good group to find a professional home: it was a collegial group that even if people disagree, they try to do it respectively and professionally. All his insights were accompanied by a huge smile and confident eyes, and somehow he was able instill optimism in me. At that moment I knew this long voyage from Vancouver to France was worth it and I will continue do it to years to come. In many respects, Mark's attitude continues to rule the RUD group that has grown immensely in the following years, probably because of the collegiality that remains to date.

Thanks, Mark!

The Beginning of a Beautiful Friendship

Edi Karni

I had heard of you long before we met. In the early 1980s, David Schmeidler and I had just finished writing a paper axiomatizing subjective expected utility with state-dependent preferences. We shared our results with Frank Fisher, who was visiting Tel Aviv University at the time. He suggested that we contact you, because "Mark Machina knows everything worth knowing about decision theory."

I soon read your seminal *Econometrica* paper, in which you introduced local utility analysis. This original and insightful work not only introduced innovative analytical tools, it showed how decision theory could be extended to accommodate compelling experimental evidence. It is a model of theoretical work motivated by and shaped by empirical evidence. Studying it had a huge impact on my thinking — and it has influenced my research ever since.

We met for the first time a few years later, when you invited me to give a talk at UCSD. We watched your favorite movie, Casablanca — an apt choice, it turned out, as the occasion marked the beginning of a long friendship. During a long walk on the beach, we discussed the emerging non-expected utility theories. This walk was the first of many such walk-and-talks, which stretched out over time and place, from the walls of the Old City of Jerusalem to the Grand Canal of Venice to the quays of the Seine in Paris to the Philosophers' Walk in Heidelberg and the hills of San Francisco overlooking the Golden Gate Bridge. These conversations combined exciting intellectual intercourse with a deep sense of friendship against backdrops of sublime beauty.

For almost 40 years now, we have discussed research ideas long before they took definite shape. Our conversations have been a source of inspiration and a great help in clarifying my thinking. To me, Mark, you are the model of the true scholar. I admire your intense curiosity, unwavering intellectual honesty, excellent judgment, and, of course, seminal contributions to our field. From your pathbreaking concept of local utility analysis through your work with David severing the link between choice-base definition of subjective probabilities and expected utility theory to the modeling of almost objective probabilities, your contributions have inspired my own work, much of which builds on and could not have been done without them.

Inspiration

Peter Klibanoff

You and your writings have been an inspiration to me in my career, as I know they have been for many others. I recall that my first time meeting you in person was at a Harvard talk and dinner you gave in the late '80s for PhD and undergraduate students on Dynamic Consistency and Nonexpected Utility. It was brilliantly clear and insightful, as well as engaging — all traits that are wonderful attributes of yours. Thanks so much for all your contributions to the intellectual life of the decision theory community and for your active and stimulating participation in so many conference discussions over the years. Hope to see you again soon.

Someone to Look Up To

Sujoy Mukerji

I've regularly met up with Mark at summer disciplinary conferences from around the time I left grad school. I grew to cherish these meetings and to look forward to them. We talked about maybe something one of us have been working since our previous meeting or some strand of the literature that had piqued our interest. It was not simply the privilege of engaging with one of the best minds in the discipline, awesome as that was, that have made me treasure these occasions. One constant, and defining characteristic about Mark, is that he never talks down to you. I could argue freely, and indeed, did not have to be afraid to make mistakes in doing so. That I could feel free to do so was what made these discourses so edifying (for me) and demonstrated to me the mark of truest and deepest scholarship.

Mark, warmest wishes for your retirement! But, I remain in hope we will still have the opportunity to resume our chats time to time.

Tribute to Mark Machina

Bertrand Munier

Almost 35 years ago, in the late spring of 1986. Mark participated in a conference organized at Aix-en-Provence, France. One of the most expected events in the conference was a plenary session under the form of a medieval *disputatio* on non-expected utility, then a relatively new topic. I was to chair that Allais-Machina debate and this was the beginning of an everlasting friendship. It was a rather delicate and intense hour, but it ended quite nicely. Both approaches to non-expected utility kept their appeal to most participants. New talents like Mohammed Abdellaoui — then my doctoral student — were attracted to the field in large part due to that debate. The audience admired the two main speakers and everyone was pleased. Mark wittily eased the atmosphere by suggesting replacing X-efficiency by Aix-efficiency, thereby granting that the debate had been fruitful.

Nobody realized at the time that the debate would take several years later the form of what Anatol Rapoport could have called a quasi-fight. It happened through phone calls, while I held invited lectures in a Moroccan University. I tried to be a moderator again, between Morocco and Allais in Paris on one side, between Morocco and Mark in La Jolla on the other side (a small fortune in hotel phone charges!). That time, Aix-efficiency could not be sufficient and fairness required that I would not, as the editor of *Theory and Decision*, give way to Allais' demands, which were definitely excessive. Allais, who meanwhile had received the 1988 Nobel Prize, told me on the phone that our friendship was terminated and that he would never talk to me anymore (after a few months, he nevertheless called again, and we remained good friends until his passing).

Both situations display Mark as a profound scientist, an easygoing and yet courageous and strong individual, a real friend, always curious to understand emotions that others might feel, always ready to appreciate what others do or did achieve. I specifically remember his capacity to marvel at a funerary building dating back 4500 BC in Brittany (the oldest building in Europe) as if it had been a pathbreaking and elegant solution to a complex problem. What an exceptional personality!

The Machina Student

Bill Neilson

Congratulations on your retirement! My own retirement prompted reflection on the path that got me to where I am today, and that led me to think quite a bit about your role in my life. I thought about you more when I was in San Diego for the theory conference in January 2020. But even before both of those, I thought about you as I was working on one of my last published papers.

That paper generalizes the measure of Ross risk aversion from its original form to a ratio of an nth derivative over an mth derivative (with $m < n$). Just from the topic it obviously reminds one of the paper you graciously allowed me to co-author with you when I was in graduate school, "The Ross Characterization of Risk Aversion: Strengthening and Extension," but it goes deeper than that.

Both papers rely heavily on Pratt's (1964) *Econometrica* paper by establishing an equivalence (as you taught me) between a derivative condition, a mathematical condition relying on concavity, and behavioral conditions. When my co-author, Liqun Liu (Texas A&M) first approached me about the project, he already had ideas for the mathematical condition, a behavioral condition based on Pratt's probability premium, and another behavioral condition based on a comparative-statics exercise. I thought this was incomplete, though, because the paper really needed a risk premium condition. After all, the risk premium condition played a huge role in our *Econometrica* paper, and it also provides a very intuitive notion of what it means for one person to be more risk averse than the other — the first person is willing to bear a larger mth-order risk than the second person to avoid an nth-order risk.

Formulating the risk premium condition, though, is not as straightforward as it is in the standard, second-order risk case. In our *Econometrica* paper, we started with a stochastic risk premium and scaled it up or down, but that doesn't work with an mth-degree risk premium when $m > 1$ because scaling up the premium also scales up all of the moments below m, which means that that it is not an increase in mth-degree risk. This problem in turn made me think about you even more, because it allowed me to use a mathematical trick that I know only because I worked with you, and I don't know how readily this trick comes to anyone else.

In order to establish a risk premium condition where the (n/m)th-degree more risk averse individual is willing to pay a "larger" mth degree premium to avoid an nth-degree risk, Liqun and I established a parameterized path from the initial, random wealth position to a position with more mth-degree risk. This allowed us to define the "larger" mth-degree risk premium as a move farther along this path, in the sense that the more risk averse individual moves farther along the path before becoming indifferent to an nth-degree riskier lottery than the less risk averse individual does. This is essentially what you and I did in Section 2 of our *Econometrica* paper, and it was great to be able to use this idea again.

I was very fortunate to have worked with you, and you did so many things that I repeated with my own doctoral students. You met with me regularly. You pushed me to do better. You taught me how to write a paper. You taught me to restrict myself to writing sentences I was sure were true. I ended up publishing papers with 15 different students over the years, and I passed all of your lessons on to them as well as I could.

There were two other things that you did that I tried my best to do in my own career. One is that you are a joyful writer. You are clearly excited by what you write about and happy to share it with the reader. Papers are so much better to read when the author is happy, and you and David Kreps are my two favorite examples of this. One time when I was working with Jacob LaRiviere (another UCSD student) he commented on liking the way that I write. I told him I try to write happy, and that I got that from you. The other thing you did was you lit up when you talked about economics, whether talking about research or teaching a class. I do not naturally convey excitement, but I always tried to channel you when I taught and when I gave research presentations. I had a long way to go because I was not a natural speaker, didn't really like attention, and was very nervous at the front of a room. I conquered all of that, and it helped greatly to have a model for what I wanted to be.

Since I get to carry the mantle of "The Machina Student," I want to tell you how that turned out. I had a great career and I am grateful to you for making that happen. I started at Texas A&M and stayed there for 18 years, achieving the rank of full professor. That department was light on pure theorists, but it was heavy on applied theorists and so throughout my career I have done a combination of pure and applied theory work. I eventually moved to the University of Tennessee, Knoxville, when they offered me an

endowed chair and an opportunity to build a department the way I thought it should be built, which took its inspiration from what I thought UCSD was like in the '80s, largely from watching you, Vince, Mike, Joel, and Hal. I'm proud of how UTK's department turned out, and although they cannot yet publish in the very top journals with regularity, they can hit the top field journals.

I managed to publish 60 journal articles during my career although I clearly peaked in terms of placement with my first paper. I learned sitting in your office that it's important to be on editorial boards, and I had mixed success with this. I did not get to be an associate editor much, but I did serve as editor-in-chief of two different journals (*Economic Inquiry* and *Journal of Economic Behavior & Organization*), which means that I handled about 7000 papers during the two editorial appointments. That eventually wore me out, which is one of the reasons I retired before you did.

Every year I looked at UCSD's job candidates to see if you produced another student. Even though I'm an only child, your academic family tree is quite large now. I served as chair or co-chair of 19 dissertation committees, and these 19 academic grandchildren of yours have gone on to become dissertation advisors for some academic great-grandchildren. I do not know if you have any great-great grandchildren yet. Here are a few highlights for your grandchildren, since I want you to be a proud grandpa. One grandchild (Scott Gilpatric), is a full professor at the University of Tennessee, Knoxville, which is supposed to make you feel old. Another one (Jill Stowe) is the equine economist for the University of Kentucky, which seems like a really good job to me. You probably met her when she was on the faculty at Duke. And one of them (Air Force Major Charlton Freeman) will likely succeed in bringing Thaler and Bernatzi's Save More Tomorrow program to the entire military, which means he will have a much bigger impact on the world than I ever did. But I'm proud.

I close with a thank you. Thank you for teaching me well and setting me up for a great life and a great career. I have been watching you from afar, and you've remained impressively successful, too. I'm very glad.

Encouragement

John Quiggin

I first met Mark at an Economics Society conference, in Tasmania in the mid-1980s, at a time when I was still working as a civil servant for the Australian government and had seen no response to my 1982 article on Anticipated Utility (aka Rank-Dependent Utility). Mark saw the point of my idea immediately, and encouraged me to pursue it. Without that encouragement, I might have abandoned decision theory for good. I don't think I'm alone in this kind of experience. As well as making fundamental contributions of his own, Mark has played a crucial role in promoting the field of generalized expected utility theory.

First two meetings with Mark Machina as I remember

David Schmeidler

By now everyone knows that a memory of an event is what the person remembers distorted by his wishful thinking etc. Additional remembering of the event is his last remembering with an additional distortion. As I met Mark many times over the years and our first meetings popped up there is a lot of accumulated distortion. If on top of it the remembering person is partially senile, draw your own conclusions.

Why two meetings? Because Mark has two personalities. Both are very pleasant and fun to be with. Both are top in presentation. The first personality is very considerate and helpful. The second is extremely arrogant. One meeting was in a conference in San Sebastian, and the other was during a half day visit to Princeton University. (Hugo Sonnenschein arranged both meetings.) My guess is that I met Mark 2 (the arrogant) first. In one of these meetings I impressed him with pointing out the Bayesian school solution to his puzzle. When we met in San Sebastian he mentioned Savage's axiomatization in context of his work (his representation result). I then challenged him to axiomatize his representation. It seemed to me possible and at that time I still knew mathematics quite fairly and relied on my intuition.

Further Adventures with Machina's Mom

Uzi Segal

One year in the early 2000's I was invited by the econ department at the Hebrew Univesrity to teach an undergraduate mini course in distributive justice. If you've ever visited the Mount Scopus campus you'll know what I mean when I say that it took me some time to find the class room (they have a very peculiar way of enumeration — number 5314 is not room number 14 on the third floor of block 5, but room number 14 on the fifth floor of block 3. Never mind). Well, the room was full to capacity. More than 50 young people, all eager to learn all I knew about distributive justice. The room was well equipped, it had everything needed for a brilliant lecture, teacher included. So I went back to the department office and asked for the correct room number. It was a permutation of the original one.

It was a smaller room, and in it there were three students. As I presently learned, one was from one of the West Bank settlements. The other two were Arab students from a village in the Galilee. The first hinted that he and I were on the same side (of what equation I'm not sure). The other two informed me right away that they have no interest whatsoever in distributive justice, but as they needed one more credit unit to complete their degree requirements, they chose mine. So with these encouraging signs we took off.

It turned out to be a lot better than I feared, and by the third lecture they all became friendly to each other (and to me). We talked about dynamic consistency, and I told them the story of Machina's Mom. We all agreed that Mom should not flip again and should rather give the cake to Abigail. In his paper, Mark goes a step further, and explains that Mom's updated preferences changed, in the same way that preferences over pizza and salad change after consuming one of them. To demonstrate this point, I offered one of the two students from the Galilee a (virtual) choice between pizza and salad, and he chose the salad. And again. And again. After the fourth salad I asked him if he doesn't get hungry. He admitted he had too much (virtual) salad, but explained "I once tried a pizza. It was awful. I don't understand how anyone can eat anything like that. I'm not going to have it again, real or virtual, regardless of how many more portions of salad I'll have to eat."

I wasn't invited to teach a similar class again.

Mark Machina: Appreciation

Marciano Siniscalchi

Mark Machina occupies a central place in my academic journey. For starters, he was the very first Famous Economist I ever met. Actually, "met" is an overstatement. I attended the FUR Conference in Oslo in 1994, as a young(ish), very excited soon-to-be Ph.D. student. As I was lining up to check into my hotel, I noticed a gentleman who was engaged in conversation with the concierge. I immediately knew that he was a conference participant; moreover, I got the nagging feeling that he was someone I was supposed to be able to identify. But I came up blank, and didn't really have the courage to walk up to Famous Mystery Economist and introduce myself. The mystery was solved a couple of days later, when I saw Mark behind the podium in a large lecture hall at the BI Norwegian Business School. Silly me, of course I should have known who that gentleman was!

On a more serious note, I am pretty sure that Mark's wonderful "Reflection example" helped me coax a couple of recalcitrant *Econometrica* referees into begrudgingly accepting my paper on vector expected utility. So let me take this opportunity to formally thank Mark for that!

Most of all, I am truly grateful for the opportunity to coauthor a paper with Mark, our survey on "Ambiguity and Ambiguity Aversion," published in the *Handbook of the Economics of Risk and Uncertainty.* We were only given three months to complete the task, so the pace was necessarily a bit ... intense. But having an opportunity to chat with Mark a couple of times a week (if not more), learning about the development and evolution of ideas, with the occasional anecdote thrown in for good measure, was a joy. This experience made me a better scholar and, I hope, a slightly better writer as well (though of course I could never come up with anything like Abigail and Benjamin's story). Of course, one should also mention the cost of coauthoring with Mark, which is to write using Microsoft Word, using very specific math fonts from 1995 that Mark really likes. But even this die-hard LaTeX fanatic is willing to say that the benefits of interacting with Mark far, far outweigh the cost!

To sum up, thank you Mark for all I have learned from you and your papers. And please keep those wonderful examples coming — I have more papers I need to get published!

Some Things I have Learned from Mark Machina

Joel Sobel

Mark and I never came close to writing a paper together. Perhaps we both wanted to preserve a friendship. All the same, most of what I know about decision theory I learned from him. Some lessons came from his formal presentations or from his questions during seminars. Sometimes he asked me to tag along while he and a visiting decision theorist exchanged ideas in code that I rarely could crack. But the master classes came when he approached me to talk about his research. When he had questions, they were of the form "Do you think that the font size is big enough on this slide?" What typically happened is that he gave me a mini-lecture on a research topic, patiently translating my uninformed questions into serious observations, but more often engaging in a conversation with himself. He'd worry that he hadn't asked the right question or hadn't asked it clearly enough. He would vary things slightly and then try again. After a while, I'd leave and he'd thank me generously for my help. Except for saving him the possible embarrassment of being caught talking to himself, I didn't help at all, but I was happy to accept the praise.

Soon we would have another chat. The nature of the conversations did not change much. Mark would tell me about the same problem many times. The details of the conversation did change. Mark sharpened his result, figured out exactly how general it was, and eventually found an extraordinarily engaging way to describe the problem. What I really got were rehearsals for what became brilliant seminar presentations and clean publications. The published record (and even memories of public lectures) erased the process, but nothing in Mark's work came easily. The exact statement of problems, the finest details of examples, and not just the number of clauses in an equivalence statement, but the way they were ordered, were the result of a long process of tinkering and perfecting. And Mark paid the same attention to "cosmetic" features: choice of notation, font size, the timing of his jokes. There were no accidents.

I've learned a lot from what Mark said in seminars. A common question was "Can you tell me the units?" Anyone can ask this question in most talks. That doesn't make it a bad question, because a surprising number of speakers cannot answer it. I won't ask the question when Mark is in the room, but he has trained me to look at equations and verify that they are consistent with

crude "dimensional analysis." First principles matter and you can begin to understand material far from your expertise by just using consistency checks. Another common remark consists of a suggested change in terminology or notation. It has taken me a long time to appreciate these remarks. The speaker wants to convey her novel research findings in a talk. Notation and terminology are secondary to the main ideas. But it turns out that proper notation permits one to communicate more efficiently and proper terminology helps one draw the right connections from related literature. Some of the suggestions are distractions, but a shockingly large fraction clarify the underlying structure.[1] In his own work and in his appraisal of others, Mark does not separate discovery from communication. The next class of comments are remarks that reframe the speaker's work more generally, stripping away restrictive assumptions or a specific application to reveal a broader, more elegant, insight. Mark sees forest when others see trees. Finally, Mark would frequently close a seminar with an elaborate, groan-inducing pun.

Mark interests are broad. He is curious and takes joy in science, history, music, and nature. He loves to share what he knows and often assumes that everyone should like what he likes. He has taught me his preferences, but what I have really learned is de gustibus non est disputandum. I do not to try to convince him that there are better movies than Disney's 2017 "Beauty and the Beast" and better restaurants than "The Old Spaghetti Factory."

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[1]Two brief asides that may be relevant, but aren't about Mark. In my experience, the only one better than Mark at suggesting better notation during seminars was Terence Gorman. Gorman would typically interrupt a speaker in the first five minutes of a talk with an off the wall "Why don't you start that sum at $t = 0$ instead of $t = 1$?" With experience I learned that some essential expression that appeared later in the talk would look much simpler if the speaker had adopted Gorman's notation. The second story comes from S.S. Chern, the leading 20th century mathematician working on differential geometry. Chern said that greatest contribution of Gauss (generally viewed as founder of the field) to differential geometry was the notational convention that $p_i x_i$ was interpreted as $\sum_{i=1}^{n} p_i x_i$ (repeated indices indicated summation). The convention simplified formulas and made it easier to identify deeper mathematical truths.

Allez les Bleus

Jean-Marc Tallon

I met Mark in Paris in the late 1990s. He came to the Risk, Uncertainty and Decision conference that Alain, Michèle, Jean-Yves and I were organizing. Actually, I can be more precise: it was in 1998 and Mark had no idea that the major event going on in France was not RUD but the Soccer World Cup . . . this is the way I've always seen Mark, a sort of Savant Cosinus[2] fully dedicated to his research.

Having Mark in these conferences really made a difference. First by his involvement, his insightful questions, the quality of his presentations (forever an example for me) and his willingness to share his knowledge. Second, by his kindness to all (students and young researchers included). Always in search of a pun or witty comment, Mark is accessible to all. The mix of his student (schoolboy?) sense of humor and his great scientific rigor makes a great combination. The constant twinkle in his eyes says it all!

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[2]L'idée fixe du savant Cosinus is one of the earliest French comics, published in 1899.

The Most Precious Commodity in Decision Theory

Peter Wakker

My first submission to *Econometrica*, an axiomatization of subjective expected utility, was rejected, and rightly so because it was too marginal. However, the referee report was exceptionally constructive. It ended with "I encourage the author to turn his talents towards more promising directions." Message understood! I went for nonexpected utility.[3] I have always known for sure that this referee was Mark Machina.[4]

Typical of Mark is, indeed, his constructive nature. This applies to the famous paper Machina (1982). The typical paper of those days, and in conferences one lecture after the other, would spend its first quarter bashing expected utility, then explain the Allais paradox in detail, then present a model that did nothing but accommodate this paradox, and then end with again bashing expected utility. Mark's paper was very different; indeed, constructive it was. Its main message was that many good properties of expected utility can be kept in great generality, in particular at local optima. Miraculously many. The paper was historically pivotal in making economists turn to the psychological game of nonexpected utility. It provided the basis of nonexpected utility in economics, a cornerstone of the modern behavioral approach. The great intellectual impact of Machina (1982) is also due to another feature of Mark. His papers are always written in exceptionally didactical ways, accessible to wide readerships. They are recommended readings for everyone. Mark is the greatest perfectionist I ever met, chewing and rechewing every word until it is perfect. Mark did not often want to co-author with others, because he would only accept any writing that completely fulfilled his highest standards.

I often feel sorrow for new generations of researchers because they often lack having been exposed to Mark's writings. In my generation, Machina (1989) was standard knowledge. Every researcher applying nonexpected utility in dynamic settings was aware of the many pitfalls. But many modern researchers lack awareness of these issues, naively and implicitly adopting all kinds of dynamic decision principles in nonexpected utility.

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[3] Be it solely and purely for descriptive reasons, with me being Bayesian.

[4] A well-known bias of young authors is to think that their referee must have been the most famous person in their field. I was informed about this bias only when it was too late to change my mind.

Every word in Machina (1982) transpires that he considers deviations from expected utility to be rational, and everyone comes out thinking that this is the case. Yet, it is actually never stated explicitly. This is, again, typical of Mark. He is extremely diplomatic and, yes, political. He will never explicitly write negatively about leading models or researchers. His papers are smooth. It is the unavoidable price to pay when writing didactically, and reaching wide audiences. I have been able to consume the most precious commodity in our field of decision theory: spoken conversations with Mark Machina. There appears the full depth of his ideas, which do not shy away from being controversial. Every word that Mark wrote comes from his deep insights, but those insights often do not surface easily. Still, by digesting every word written by Mark, all our thoughts are led into right directions.

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