

In Memoriam: Dan S. Felsenthal

Dan S. Felsenthal, Professor Emeritus of Political Science at the University of Haifa in Israel, died in Jerusalem on February 20, 2019, at age 80 following a period of declining health. Over the course of a career that spanned more than 50 years and that included frequent visits to the U.K. and an extended stay in the U.S., Dan made major contributions to mathematically oriented political science and public choice — in particular, the study of social choice, voting power and procedures, coalition formation, and other applications of game theory to politics.

Dan was born and raised in Jerusalem. His father was born in Mannheim, Germany, and studied ophthalmology at the University of Heidelberg, thereafter joining the third generation of physicians in his Jewish family. In 1935 he escaped from Germany and emigrated to British mandated Palestine, where he met his wife, the daughter of a prominent Sephardic Jewish family that had lived in Jerusalem for at least seven generations. He subsequently volunteered to serve in the British army as a physician for the duration of World War II. Dan was 10 years old and living in Jerusalem at the time of the declaration of independence of the state of Israel and the first Arab-Israeli War, events which left a deep impression on him.

Dan's father joined the ophthalmology department in the main hospital in Haifa in 1950, and the family moved to Haifa, where Dan graduated from high school. Like all Israelis, he was drafted into the military and served as an army aerial photographer. In 1962 Dan married Ilana Kliński, who would have her own academic career, and together they raised three daughters, Noorit, Karni, and Ayala. In the meantime, Dan enrolled at the Hebrew University in Jerusalem, studying political science and economics as an undergraduate and staying on to earn an M.A. in political science. He submitted his thesis (on Israeli government policy towards higher education) days before the outbreak of the Six Day War, in which he participated as an army reservist. Immediately after the war, Dan was awarded his M.A. degree with honors.

Shortly thereafter the Felsenthal family moved to Boston. With the support of a Fulbright Fellowship, Dan enrolled in the Ph.D. program in political science at M.I.T. while Ilana studied at the Harvard School of Education. Dan's dissertation dealt with health care policymaking and administration. He then spent a postdoctoral year at the Harvard School of Public Health doing further research on the role and experiences of immigrant physicians, such as his father; this research led to his first published articles, which appeared in medical journals. A year after Dan and Ilana's youngest daughter was born in Boston, the family decided to explore the U.S.A. beyond the east coast; they set out on a three-month road trip around the country, driving an old Ford Country Squire station wagon and towing an even older tent trailer.

In 1972 the family returned to Jerusalem and Dan joined the Political Science Department at the Hebrew University while Ilana joined its School of Education. There he became a mentor to Ph.D. student Abraham Diskin, with whom he subsequently collaborated in many research projects and publications. When Haifa University acquired independent academic status, Dan joined its School of Political Sciences and began a long period of commuting between Jerusalem and Haifa. In 1976, he published a two-volume text (in Hebrew) on *Mathematics for Administrative Decision Makers* as well as a coauthored article in *Administrative Science Quarterly* and subsequently a solo-authored article in the *Public Administration Review*. But otherwise his attention turned to topics within the developing field of public choice theory. Over the next two decades, Dan published more than two dozen articles on such topics as the bargaining problem, bargaining processes, international

conflict and cooperation, coalition formation and payoffs, voting methods (in particular, approval and cumulative voting), sincere versus sophisticated voting (particularly in large elections rather than committees), and electoral systems. These papers appeared in such leading international journals as *Behavioral Science*, *Comparative Political Studies*, *Electoral Studies*, *Games and Economic Behavior*, *International Interactions*, *International Studies Quarterly*, *Journal of Conflict Resolution*, *Political Behavior*, *Public Choice*, *Simulation and Games*, and *Theory and Decision*, and as chapters in several edited volumes. Many of these papers were written in collaboration with other leading Israeli political scientists — notably Diskin, Amnon Rapoport, and Zeev Maoz. Some of this work was summarized and extended in his book on *Topics in Social Choice: Sophisticated Voting, Efficacy, and Proportional Representation* published by Praeger in 1990.

During one of Ilana and Dan's annual visits to London in 1989, he began collaborating informally with Moshé Machover, who was both Ilana's cousin and a highly respected mathematician and logician in the philosophy department at King's College, University of London. As his thoughts were never far from the puzzles and paradoxes that beset his ever growing interest in voting theory, and as a political scientist with a mathematical background sufficient for him to recognize that he could benefit considerably from working closely with a real mathematician, Dan had for some time set himself the task of persuading Moshé to join him in research. Some details of what would become perhaps the most productive research partnership in the field of voting theory are provided in Rudolf Fara's interview with Dan and Moshé that appears in the Festschrift volume described below. Dan recalled: "My efforts were finally successful when ... I told Moshé about an article that I had recently read — one about the saw-tooth function phenomenon of what was called 'the quorum paradox'." Moshé recalled that the quorum paradox "turned out to be a simple problem in finite combinatorics and probability, and I could solve it quite easily. There is nothing a mathematician likes better than solving a problem in a field other than his or her own. So I was very pleased that I was able to help. This got me hooked, and we started to collaborate. It made a very welcome change in my research work, and I owe this productive turn entirely to Danny." (Dan published the resulting paper on "Averting the Quorum Paradox" in *Behavioral Science* in 1991, crediting Moshé's assistance.) As Dan further recalled, "This was the beginning of a wonderful and fruitful collaboration; the rest is history." Their first joint paper, "After Two Centuries, Should Condorcet's Voting Procedure Be Implemented?", was published in 1992 also in *Behavioral Science*. They would go on to coauthor a major treatise and a prodigious number of top-class papers on the subject of voting power.

At the time Dan and Moshé began their collaboration, the two major voting power indices, due to Shapley and Shubik and to Banzhaf, were generally regarded as approximately equivalent variants of the same concept. However, Dan and Moshé showed in their first joint paper on voting power ("Postulates and Paradoxes of Relative Voting Power: A Critical Re-appraisal," *Theory and Decision*, 1995) that the former satisfied several appealing postulates while the latter, along with other less standard indices, did not; accordingly, they concluded that Shapley-Shubik was the only reasonable index of a priori voting power. But a follow-up paper written with William Zwicker ("The Bicameral Postulates and Indices of a Priori Voting Power," *Theory and Decision*, 1998) showed that Shapley-Shubik failed another plausible postulate which Banzhaf satisfied. Thus both major indices seemed to have major failings. This conundrum led them to wonder whether "our

original, vague idea of unspecified ‘voting power’ conceals more than one precise idea, because there is more than one type of voting power. The history of science knows many instances of intuitive notions that, when subjected to rigorous explication and analysis, yielded two or more precise notions that had previously been conflated with each other.” This inquiry led them to the distinction between “power as a voter’s expected share in a fixed purse to be distributed among the voters (P-power), and power as a voter’s a priori ability to influence decisions arrived at by voting (I-power).” The Shapley-Shubik index, explicitly derived from cooperative game theory, is a measure of P-power; when summed over all members of the voting body necessarily adds up to one (or some other constant representing the value of the fixed purse). In contrast, the Banzhaf approach is implicitly probabilistic in nature and when formalized becomes a measure of I-power — specifically, given that everyone votes as if flipping fair coins, the Banzhaf power of a voter is the probability that the outcome turns on how he or she votes. As such, this absolute Banzhaf measure does not sum to one (or any other constant), though it can be transformed into the (less informative) relativized Banzhaf index that does sum to one.

Dan and Moshé’s magnum opus, *The Measurement of Voting Power: Theory and Practice, Problems and Paradoxes* published by Edward Elgar in 1998, further developed these insights and thereby provided the first “systematic critical examination and exposition of the foundations and methodological presuppositions of the theory of a priori voting power” that had been previewed in their paper with Zwicker. Along the way, they observed that Banzhaf’s implicitly probabilistic ideas had been anticipated by the explicitly probabilistic work of Lionel Penrose almost two decades earlier and that James Coleman, while evidently unaware of either Penrose or Banzhaf, had incisively critiqued the Shapley-Shubik index as a conceptually inappropriate measure of I-power — without, of course, using that term. (Dan and Moshé set out this intellectual history more fully in “Voting Power Measurement: A Story of Misreinvention” published in *Social Choice and Welfare* in 2005.) In addition to the foundational theoretical chapters, their book includes two empirical chapters: one dealing with court cases in the U.S. flowing out of *Baker v. Carr* pertaining to whether weighted legislative voting could be a remedy for malapportionment of legislative districts, and the other examining weighted voting in E.U. institutions, particularly the Council of Ministers.

Much more could be said about this seminal work but suffice it to say that it will maintain a dominant place in the subject for generations to come. Here is a selection of snippets taken from a few of the many enthusiastic reviews: “To say that this book is excellent would be an understatement. It is really remarkable” (Maurice Salles); “This book pulls no punches in exposing confusions in the orthodox approach to voting power. Its clarity and good sense point the way to a better founded theory...” (Ken Binmore); “It is at the cutting edge of research in the theory and measurement of a priori voting power, but it is also of practical and political relevance...” (Matthias Sutter).

In their interview with Fara, Dan and Moshé described how the duo conducted their long-distance research, with Dan in Jerusalem and Moshé in London.

MM : Danny is usually the driving force (not to say slave-driver) as he is very industrious (not to say workaholic) whereas I tend to be work-shy until my interest in something is really aroused. So usually it is Danny who proposes a problem or a project, for example,

writing our book on voting power. And often he also writes a first draft or at least an outline. Then I get to work on it, edit it and develop the mathematical technicalities and look after the English style. I send this edited version to him, and he amends it and sends it back to me. And so it bounces back and forth like a ping-pong ball until it is completed. Danny usually has the last word, as he is much better than me in spotting typos and other lapses. I should also add that while I do most of the formal and abstract mathematical presentations Danny invents most of the tricky examples, especially counter-examples.

DF: Moshé's description of the process we underwent in producing our joint work is accurate, and his description of my share is very generous. I would like to add ... [that] I have worked with other partners during my academic career, but my collaboration with Moshé was the longest and most fruitful. This was, among other reasons, due to the fact that Moshé is a very patient partner, and despite our different work styles, we always managed to settle whatever (few) disagreements we had.

Fara and Machover had founded the Voting Power and Procedures (VPP) program at the London School of Economics in 2000 with the objective of exploiting pedagogical media expertise to bring voting power and related issues to a wider audience including politicians and their advisers, journalists, academics and their students, and interested laypersons. Dan soon joined the program (along with Dennis Leech and Maurice Salles), and Dan and Moshé swung into action immediately, producing a non-technical primer on the voting challenges created by the proposed enlargement of the EU to be negotiated in the Treaty of Nice in 2001. This provided the basis for VPP's successful application for funding from the Leverhulme Trust for further development of the field of the measurement of voting power, with a particular focus on the system of qualified majority voting in the EU Council of Ministers, an issue that gained further salience with the further EU enlargement in 2004. As well as coauthoring with Moshé some two dozen published articles and many more reports available on the VPP website, Dan contributed immensely to the twice-yearly round of VPP-sponsored public lectures and to its annual workshops, symposia, and conferences held variously in the UK, France, and Germany.

In 2007 the Leverhulme Trust approved funding for a further research initiative on *Voting Power in Practice* that would emphasize practical applications of voting theory and intense interactivity between practitioners and theorists from various disciplines in the field. Dan took to this project with great enthusiasm, starting with a workshop on a posteriori, or actual, voting power, and the problems of 'one person, one vote' and gerrymandering. Although Dan continued to keep abreast of developments in the field of voting power, his attention shifted back to his earlier research area of voting procedures and their susceptibility to various problems and paradoxes. In 2009 Dan proposed a workshop to focus on two objectives: (1) to try to reach a consensus regarding the relative degree of severity which may be attributed to the main paradoxes afflicting voting procedures designed to elect one candidate out of three or more; and (2) to try to formulate necessary and/or sufficient conditions for the occurrence of the main paradoxes under each susceptible procedure. Dan's detailed outline was presented as a working paper at a VPP symposium held at the LSE in May 2010 and then at the workshop itself held at the Chateau Du Baffy in Normandy, France, in the summer of 2010. The final version appeared as a 70-page chapter in Dan and Moshé's edited collection of papers presented at the workshop, *Electoral Systems: Paradoxes, Assumptions, and*

Procedures published by Springer in 2012. It would be fair to say that Dan was disappointed that the workshop failed to achieve his two objectives, but this setback spurred him on to further efforts.

Since this area of research was of less interest to Moshé, Dan began to publish papers with other coauthors — notably, Nicolaus Tideman and Hannu Nurmi — on Condorcet conditions and the monotonicity paradoxes that afflict certain procedures. These papers appeared in *Public Choice*, *Theory and Decision*, *Mathematical Social Science*, and *Group Decision and Negotiation*. Dan's research partnership with Hannu Nurmi of the University of Turku in Finland, who had also published extensively on voting procedures and paradoxes, was especially productive. Together they authored three mini-volumes: *Monotonicity Failures Afflicting Procedures for Electing a Single Candidate* in 2017, *Voting Procedures for Electing a Single Candidate* in 2018, and *Voting Procedures under a Restricted Domain* in 2019, all in the SpringerBriefs in Economics series. Together they substantially fulfilled Dan's wish to examine and categorize the main voting procedures and determine their susceptibility to the various paradoxes.

In March 2011, a symposium was held at the LSE that celebrated Dan and Moshé's enormous contributions to voting theory. Many of the papers presented were included in the Festschrift volume *Voting Power and Procedures* edited by Rudolf Fara, Dennis Leech, and Maurice Salles and published by Springer in 2014, which also included Fara's interview with Dan and Moshé from which we have quoted. To Fara's final question, Dan's response is poignant in its prescience, and yet hopeful: "As to my own academic plans at age 75, I think I can use more productively whatever limited skills I still have by engaging in disseminating some of the knowledge regarding voting power and procedures that has already been accumulated than in creating new knowledge. Therefore I, together with Moshé, the editors of this volume and some additional colleagues, are now engaged in developing a novel multi-level pedagogical program, which we tentatively call *VoteDemocracy*. This, it seems to me, will be my last venture."

From the beginning, the VPP program aimed to develop a course on voting theory, exploiting audio-visual media for wide international dissemination. During a visit to London with Ilana in November 2011, Dan convened several informal meetings that developed initial thoughts for a syllabus, for a course textbook, and for teaching modules. It was roughly agreed that it would be a full year undergraduate course for credit, suitable as an elective or as a core constituent to a degree program in a number of disciplines. Dan's enthusiasm and energy for the *VoteDemocracy* course were inspirational. He and Moshé submitted the first module, a comprehensive unit on voting power. Until the very end of his life, while also collaborating with Hannu Nurmi on their books on voting procedures and paradoxes, he was in frequent correspondence with the other co-editors of the projected *VoteDemocracy* textbook — Rudolf Fara, Nicholas Miller, Friedrich Pukelsheim, and Maurice Salles — writing additional explanatory appendices and suggesting features to be highlighted, and so on. Fara recalls that his penultimate conversation with Dan, within a month of his death, explored the importance of voter participation and its relationship to political representation. For Dan, in voting, the key to achieving genuinely representative democracy was synonymous with the problem of making the correct social choice, obvious and yet elusive. Dan's most important gift to the project was his ever hopeful and unflagging optimism concerning how voter education could contribute to a fairer and more just society. This could lead ultimately to more truly representative democracy; and this, he thought, was necessary if democracy is to survive.

Dan had many interests beyond his academic work. His wife Ilana and daughter Noorit have provided some reminiscences.

Although very much engrossed in his academic work, Dan was not a single minded, single subject person. He had wide interests outside his field of study. He was extremely knowledgeable in history and geography and was an avid reader of biographies and stories about great voyagers. He was also very fond of art, never missing an opportunity to visit an exhibition, Rembrandt being his favorite painter, and the impressionists his favorite school — a somewhat conservative taste in art. From Ilana he caught “the theater bug” and while visiting London, which they often did, they tried to catch a play a day, sometimes going to the extreme of two plays a day....

The birth of his first grandson, 25 years ago, and the six following, brought great joy into Dan’s life. He adored them and was never too busy to spend time with them, and instruct them methodically in different subjects, from types of elections to all kinds of natural disasters. My grandson Yotam claims that he was the first child in kindergarten that knew what tsunami means.

When Dan retired [in 2003] he indeed stopped teaching but went on with his research and publications, having more free time helped him to initiate new projects, and invest in collaborations with colleagues from all over the world. He went on working, even when he was diagnosed with lung problems and connected to an oxygen generator.

We conclude by quoting from a memorial note (translated from Hebrew) by Dan’s former student and long-time colleague Abraham Diskin that appeared in *Yisrael HaYom* (Israel Today) a few days after Dan’s death: “Dan was not just an intellectual and a scholar but also a meticulous and fair person, generous and modest, a loyal friend and an exemplary family man. Dan had a virtue for which he sometimes paid dearly: he was a person whose mouth and heart were equal. He did not hide his opinion, even if what he had to say enraged the other side. A man of honesty and integrity, sense and sensibility. A person who pointed, all his life at the elusiveness of justice, was a compass of yearning for truth and justice. The heart aches for his loss, but the compass we inherited from him will accompany us forever.”

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