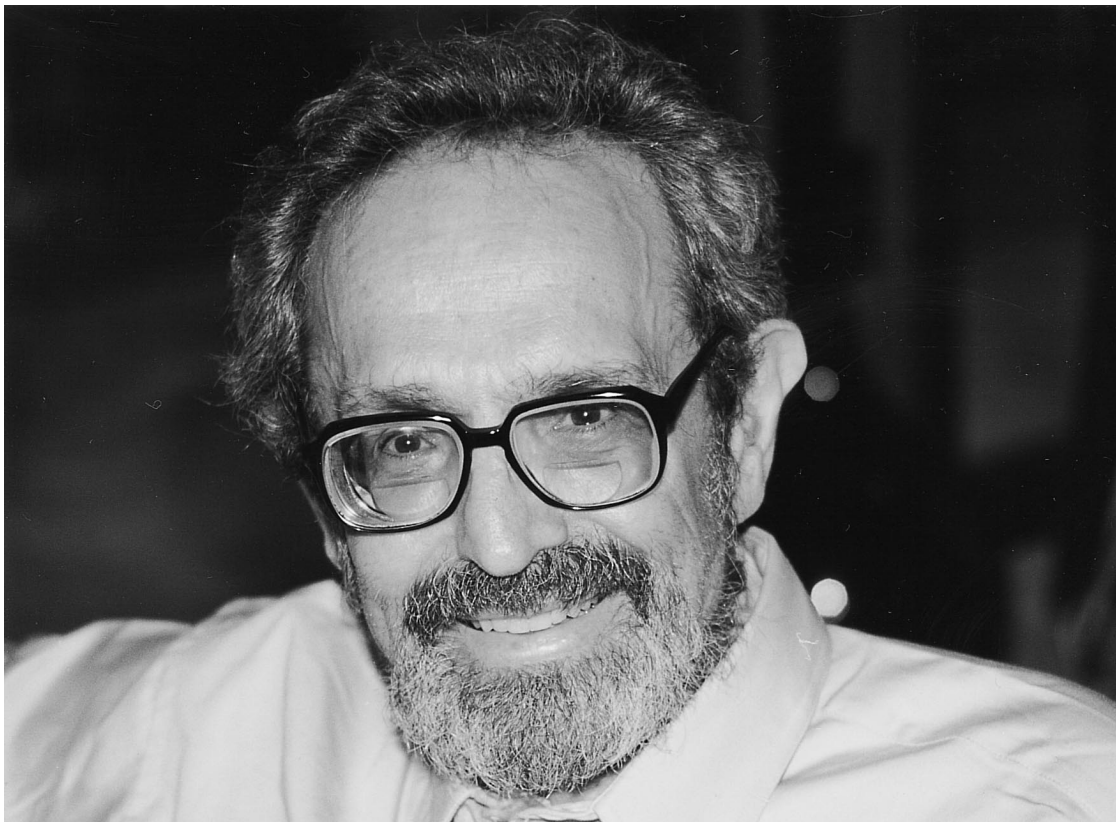


In Memoriam  
**Julius Marmur (1926–1996)**



‘Life is a shadow, saith the Scripture, but is it the shadow of a tree or a tower that standeth? Nay, it is the shadow of a bird in its flight. Away flieth the bird, and there is neither bird nor shadow.’ Quoted from the Talmud by JOHN MORLEY, in the last chapter of his *Recollections*

‘The joy of research must be found in the doing, since every other harvest is uncertain.’ THEOBALD SMITH

On 20 May 1996, I lost my dear friend, Julius Marmur; ‘*Gene*’ lost a devoted Editor who had served since 1989, and molecular genetics and biochemistry lost one of its leading scientists.

Julius Marmur was born in 1926 in Bialystok, Poland. As an infant he emigrated with his family to Canada. In 1947, he graduated from McGill University in Montreal. He received a Ph.D. in 1951 from Iowa State University, and in 1951–52 studied enzymatic pentose formation at NIH, as a Post-doctoral Research Fellow. I first met Julius during his 1952–54 postdoctoral studies with Rollin Hotchkiss at the Rockefeller Institute (presently Rockefeller University) in New York, where, among

other findings, he showed that two genes on one fragment of pneumococcal transforming DNA can be linked; he also studied the mannitol marker. I met him also in Cold Spring Harbor in 1953 and later in Paris where in 1954–55 he worked on the *lac* operon in the laboratory of Jacques Monod. Julius spent the years 1955–56 in my laboratory at the Institute of Microbiology, Rutgers University, continuing the studies he initiated in Paris and also helping us with the genetics of *Streptomyces* and *Bacillus*, by exploiting his experience with DNA-mediated transformation. Julius succeeded in transforming *Streptomyces* to drug resistance using purified DNA, even though we never got around to having this

result formally published. From Rutgers, Julius moved to Paul Doty's laboratory at Harvard's Chemistry Department, where his skills in handling bacterial transforming DNA and his ingenuity led to several major discoveries during that time (1956–1960):

- (1) Understanding how heat denaturation of native DNA results in separation of the DNA strands with concomitant loss of biological (transforming) activity.
- (2) Showing that the native DNA structure could be restored by annealing the separated strands, with simultaneous regaining of transforming activity.
- (3) Showing that density-labeled DNA strands of one DNA could be annealed with strands of another but homologous DNA, forming a biologically active hybrid double helix.

When these data were presented for the first time by Paul Doty at the Harvey Lecture, Rollin Hotchkiss exclaimed: 'This is all so beautiful and worthy of a celebration! Shall I dance right here?' (in the New York Medical Academy Lecture Room). On that evening there was a real feeling of a scientific triumph and ecstasy!

Julius is also well known for his paper in *Methods in Enzymology* (Vol. 6, 1963) on the procedure for DNA isolation ('Marmur's method', which elicited over 5000 reprint requests), and also for the establishment of a clear relationship between the G+C content of various microbial DNAs and their buoyant density and/or melting temperature. He also showed that several DNAs, mainly phage DNAs, which do not follow this relationship have chemical modifications in their DNA. I could list many other of Julius' discoveries of that period, including molecular proof that UV light crosslinks DNA strands, but this list would go on forever. I visited Julius and Paul Doty at Harvard more than once, and transplanted several of their physico-chemical techniques to my laboratory at Rutgers, and after 1960, to the McArdle Laboratory at the University of Wisconsin. At that time, I acquired many lifetime friends among Julius' illustrious mentors, colleagues and students, including Paul Doty, Helga Boedtker-Doty, Jacques Fresco, Carl Schildkraut, Bruce Alberts, Bob Round and Stan Falkow, to mention only a few. We worked together, often much past midnight. These were the Camelot days, with Paul Doty being not only a mentor, but also a very busy and influential Science Advisor to the President, J.F. Kennedy.

From Harvard, Julius moved to Brandeis University (1960–63), where he studied the DNA of various phages and genetic transformation of *Bacillus subtilis*. He moved then to the Albert Einstein College of Medicine (1963–96) where he carried out research and fulfilled various functions, including the Chairmanship of the Department of Biochemistry. During those 33 years, Julius' attention was slowly directed away from prokary-

otes and phages (although until 1972 he was still publishing papers related to *Bacillus subtilis* phages), and toward the molecular biology of yeast, much before the advantages of using yeast as a eukaryotic model were generally appreciated. He developed precise methods for the isolation of *Saccharomyces cerevisiae* DNA and demonstrated that yeast mitochondrial DNA was strongly altered, or even absent, in the *petite* mutants. He also explored the complex *MAL* (maltose) and *STA* (glucoamylase) loci with the linked permease and regulatory genes. Some of his papers relating to these systems were published in '*Gene*' [137 (1993) 223–226; 146 (1994) 137–144; 166 (1995) 65–71; coauthored by his long-time friend and South African collaborator, Professor I.S. Pretorius, whose review article on the glucamylase system will be dedicated to Julius and soon will be published in *Critical Reviews in Biochemistry and Molecular Biology*].

Julius was not only a brilliant scientist, but also a voracious reader and gatherer of scientific literature, and a very generous man endowed with a terrific sense of humor. I have a special file of Julius' long-hand jokes, copies of his favorite cartoons and many of his very funny letters. He supplied us with these, attached to his regular correspondence and editorial work for '*Gene*'. He also sent me many quotations, including those from several prominent scientists, and underlined the one from his mentor R.D. Hotchkiss: 'There are two kinds of bacteriologists—those who hate bacteria and those who love them.' I have also cited two of his favorite quotations at the beginning of this Obituary. I will keep and treasure the 'Julius file' for posterity. Because Julius was liked so much and appreciated as a scientist, his colleagues and former mentors (Rollin Hotchkiss and Paul Doty) chaired, on 7 May 1992, a celebration of the career of Julius Marmur under the title of 'Three Decades of DNA'. Moreover, the Albert Einstein College of Medicine has established the Julius Marmur Research Award Fund and Endowment.

Julius and his charming wife Milly were great hosts, and I had a chance, more than once, to attend parties in their New York apartment; these included both scientists and literary figures, the latter because Milly at that time was a publisher, first at Simon and Schuster, then at Random House, and finally publisher and president of Charles Scribner's Sons. For the last 10 years, she has been a literary agent, preferring to be an author's advocate than remaining in a corporate structure.

Concerning Julius' social life, I know several amusing stories, including one incident which Julius loved to recount to his friends; once he even joked that he would like 'to have it included in his Obituary, since it would be difficult to publish it elsewhere'. So here it is, as it happened at a very slow beginning of one of the rather formal parties in the middle of the 1950s during his Rutgers Institute of Microbiology era: Julius, being an

underfed bachelor, sneaked into the host's kitchen and tasted some of the cold cuts. The next day he was called to the office of Professor Selman Waksman, the Director of the Institute of Microbiology and a Nobel Laureate, who somehow had become aware of what had transpired; Julius was admonished: 'Dr. Marmur, you should be patient and never test cold cuts in the kitchen before these are being served'. Upon which Julius replied: 'It was just a small slice of salami'. That was followed by Waksman's great pronouncement: 'it wasn't salami, it was pastrami'.—However, I must admit that opinions still remain divided among the surviving witnesses whether it was pastrami or salami.

I saw Julius for the last time in late August 1995, during the Celebration of the 50th Anniversary of the Phage Course in Cold Spring Harbor. He was vigorous, full of life, and I had no reason to even suspect that his days would be numbered because of an advancing lymphoma. He took many photos and told us many new spicy or political jokes. Furthermore, Stan Falkow wrote to me very recently that he had dinner with Julius a short time before his death, and that 'he did not appear to be ill and he was in fine form that evening'.—Julius loved life and lived a full life; therefore, the stories above are to

celebrate Julius' life, rather than bemoan his passing. But we will all miss him very much! His passing does certainly leave a big void. Our science and our lives will never be the same without Julius!

### Acknowledgements

I am very thankful to Mildred (Milly) Marmur, I.S. (Sakkie) Pretorius, Stan Falkow, Vern Schramm and Ian Willis for many helpful comments and corrections, and for Julius' photograph (by Gerald S. Cohen). An earlier obituary, prepared by Paul Doty, Julius' friend and mentor, was published in *Nature*, Vol. 381 (1996) p. 557. Moreover, obituaries were published in the *New York Times* on 22 May 1996, and in *The Guardian* on 23 May 1996.

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