

cules). This figure is the same as the current  $H_2O$  to  $CO_2$  ratio that Rubey (2) estimates for the earth. However, McElroy speculates that as much as half of the martian  $CO_2$  has already escaped to space. If one assumes that the  $H_2O$  to  $CO_2$  ratio is indeed the same for Mars as it is for the earth, this would require an amount of water still on Mars equal to the  $10^{25}$  molecules per square centimeter that McElroy has calculated to have escaped over geologic history. This would be enough water to cover the entire planet to a depth of approximately 3 m.

On the 10 percent of the planet's surface that was photographed during the near encounters of Mariners 6 and 7, Sharp *et al.* (3) mapped  $1.5 \times 10^6$  km<sup>2</sup> of chaotic terrain. If this proportion holds true for the entire planet, one would expect to find  $1.5 \times 10^7$  km<sup>2</sup> of chaotic terrain on the martian surface. If all the water estimated to be present had once occupied the chaotic terrains, they could have been filled to a depth of only 30 m. However, substantial evidence exists that the chaotic terrains occupy elevations that are actually several kilometers below their surroundings. Radar scans by Pettengill *et al.* (4) and by Downs *et al.* (5) across the Pyrrhae Regio region showed that one portion of the chaotic terrain is bordered by scarps 4.5 km high; and Herr *et al.* (6) derived several topographic profiles from Mariners 6 and 7 infrared spectrometer data which showed an excellent correlation between the areas that are one to several kilometers below their surroundings and the areas Sharp mapped as chaotic terrain. If permafrost was once to have occupied this large volume of chaotic terrain, the ratio of  $H_2O$  to  $CO_2$  that degassed from Mars would need to be approximately 100 times as great as the ratio for the earth. If this were not so, the chaotic terrains could not have been produced by the withdrawal of  $H_2O$  permafrost.

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#### References

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2. W. W. Rubey, *Bull. Geol. Soc. Amer.* **62**, 1111 (1951).
3. R. P. Sharp, L. A. Soderblom, B. C. Murray, J. A. Cutts, *J. Geophys. Res.* **76**, 331 (1971).
4. G. H. Pettengill, A. E. E. Rogers, I. I. Shapiro, *Science* **174**, 1321 (1971).
5. G. S. Downs, R. M. Goldstein, R. R. Green, G. A. Morris, *ibid.*, p. 1324.
6. K. C. Herr, D. Horn, J. N. McAfee, G. C. Pimental, *Astron. J.* **75**, 883 (1970).

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## NEWS AND COMMENT

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## RECENT DEATHS

**Rebecca Baker**, 58; professor of education, Southern Illinois University; 6 September.

**Henry J. Bakst**, 66; former dean, School of Medicine, Boston University; 28 August.

**Roger H. Bray**, 73; professor emeritus of soil fertility, University of Illinois; 10 September.

**Sam M. Beiser**, 49; acting chairman, microbiology department, College of Physicians and Surgeons, Columbia University; 7 September.

**Thomas H. Chilton**, 73; former visiting professor of chemistry, Georgia Institute of Technology; 14 September.

**Edward D. Churchill**, 76; former professor of surgery, Harvard University; 28 August.

**Howard J. Curtis**, 65; former chairman, biology department, Brookhaven National Laboratory; 13 September.

**Jess H. Davis**, 66; president emeritus, Stevens Institute of Technology; 17 September.

**Albert B. F. Duncan**, 69; visiting professor, astronomy department, University of Virginia; 29 August.

**James W. Egan**, 72; former vice president, Georgetown University; 17 August.

**Frank A. Forward**, 70; former professor of metallurgy, University of British Columbia; 6 August.

**Arthur I. Gates**, 81; professor emeritus of education, Teachers College, Columbia University; 24 September.

**Charles O. Glisson**, 74; professor emeritus of engineering, Tennessee Technological University; 15 August.

**Roy F. Graesser**, 79; professor emeritus of mathematics, University of Arizona; 23 July.

**James H. Griffin**, 80; former president, Villanova University; 28 July.

**Frederick J. Holl**, 74; former professor of biology, State University of New York College, Buffalo; 17 August.

**May H. James**, 83; former professor of social sciences, New Haven State Teachers College; 3 September.

**Trois E. Johnson**, 59; professor of public health, University of North Carolina; 21 July.

**Carol Karp**, 46; professor of mathematics, University of Maryland; 19 August.

**George V. Kendall**, 91; dean emeritus, Wabash College; 9 September.

**Daniel S. Lehman**, 53; professor of psychology, Rutgers Newark College of Arts and Sciences; 29 August.

**Mary S. MacDougall**, 89; professor emeritus of zoology, Agnes Scott College; 19 June.

**Edward G. McGavran**, 70; dean emeritus, School of Public Health, University of North Carolina; 29 August.

**Victor E. Monnett**, 82; professor emeritus of geology, University of Oklahoma; 18 September.

**William A. Mosher**, 59; professor of chemistry, University of Delaware; 23 July.

**Leonard Paris**, 56; associate professor of pathology, State University of New York, Stony Brook; 4 September.

**Thomas G. Perry**, 53; professor of geology, Indiana University; 21 August.

**Isidor S. Ravdin**, 77; former vice president for medical affairs, University of Pennsylvania; 27 August.

**Robert A. Reicher**, 45; chairman, sociology department, Barat College; 14 July.

**Hugo R. Rony**, 84; former professor of clinical medicine, University of Chicago; 8 September.

**Frederick W. Sohon**, 78; professor emeritus of seismology and mathematics, Georgetown University; 25 July.

**George P. Springer**, 53; dean, Graduate School, University of New Mexico; 29 July.

**Jacek Szafran**, 51; professor of psychology, University of Southern California; 18 April.

**Max Theiler**, 73; professor emeritus of epidemiology and microbiology, Yale University; 11 August.

**Price E. Thomas**, 50; chairman, physiology department, Kirksville College of Osteopathic Medicine; 2 September.

**Stephen P. Timoshenko**, 93; professor emeritus of applied mechanics, Stanford University; 29 May.

**Arthur V. Tobolsky**, 53; professor of chemistry, Princeton University; 7 September.

**Herbert A. Toops**, 76; professor emeritus of psychology, Ohio State University; 12 August.

**Harry L. Williams**, 52; professor of pharmacology, Emory University; 22 July.

**Claude V. Winder**, 63; physiologist and assistant director of pharmacological research, Parke, Davis & Company; 10 August.