

Abstract Submitted
for the NES11 Meeting of
The American Physical Society

Gay-Lussac Did Better Than He Knew CHARLES H. HOLBROW,
JOSEPH C. AMATO, Department of Physics & Astronomy, Colgate University —
In his 1802 paper Joseph Louis Gay-Lussac reported the first definitive experimental
evidence that many different gases exhibit the same fractional expansion of volume
when heated. This property is known as Charles Law, Amontons Law, Dalton's Law,
or the law of volumes. Gay-Lussac concluded from his experiments that many gases
expand by 37.5% when heated from 0°C to 100°C. Although his result is within
2.5% of the modern value of 36.6% = 100/273.15, the discrepancy is surprising
because his direct and simple experimental method allowed him to measure changes
in volume with a precision of a few tenths of a percent. An examination of his original
paper suggests, however, that he did not take into account that his measurements of
the initial and final volumes of gas were made at slightly different pressures. With
reasonable assumptions about the diagrams in his paper, one can use Pascal's law
and the ideal gas law to correct the measured volumes so that they correspond to the
same initial and final pressure. With this correction the results imply $\Delta V/V = .366$.
Gay-Lussac did better than he knew.

Charles H. Holbrow
Colgate University

Date submitted: 11 Mar 2011

Electronic form version 1.4