

**Sally June Tracy**  
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Carnegie Institution for Science  
Washington, DC USA

### **Research**

I use high-pressure-temperature experiments to explore the physical properties and phase stability of materials at extreme conditions up to and exceeding those at the center of the Earth. This includes studies of crystal structures, phase stability, elasticity, and deformation behavior. My main tools include both laser-drive and gas-gun dynamic compression coupled with laser interferometry and X-ray probes. This work provides experimental constraints on subjects ranging from planetary formation to high-pressure phases of deep planetary interiors. Additionally, I use diamond-anvil cells combined with synchrotron X-ray scattering to investigate the crystal structure, lattice dynamics, and spin state of materials under static high-pressure and temperature conditions.

### **Appointments**

Staff Scientist, Earth and Planets Laboratory, Carnegie Institution for Science 2019 – present  
Postdoctoral Associate, Department of Geosciences, Princeton University 2016 – 2018  
Post-Baccalaureate, Materials Science, Los Alamos National Laboratory 2008 – 2009

### **Education**

**Ph.D.** Materials Science, California Institute of Technology 2016  
**M.S.** Materials Science, California Institute of Technology 2011  
**B.A.** Physics, Occidental College 2008

### **Selected Publications**

**S. J. Tracy**, S. J. Turneure and T. S. Duffy, *Structural response of  $\alpha$ -quartz under plate-impact shock compression*, (submitted). arXiv:2005.01871

D. K. Kim, **S. J. Tracy**, R. F. Smith, A. E. Gleason, C. A. Bolme, V. B. Prakapenka, K. Appel, S. Speziale, J. K. Wicks, E. J. Berryman, S. K. Han, M. Schölmerich, H. J. Lee, B. Nagler, M. Akin, P. D. Asimow, J. H. Eggert, T. S. Duffy, *Femtosecond x-ray diffraction study of laser-shocked forsterite ( $Mg_2SiO_4$ ) to 122 GPa* (submitted).

M. G. Gorman, D. McGonegle, **S. J. Tracy**, S. M. Clarke, C. A. Bolme, A. E. Gleason, S. J. Ali, S. Hok, C. W. Greeff, P. G. Heighway, K. Hulpach, B. Glam, D. K. Kim, E. Galtier, H. J. Lee, J. S. Wark, J. H. Eggert, J. K. Wicks, R. F. Smith, *Recovery of a high-pressure phase in zirconium formed under laser driven compression*, Phys. Rev. B (in press).

M. Schölmerich, T. Tschentscher, B. Shrikant, C. Bolme, E. Cunningham, R. Farla, E. Galtier, A. Gleason, M. Harmand, Y. Inubushi, K. Katagiri, K. Miyanishi, B. Nagler, N. Ozaki, T. Preston, R. Redmer, R. Smith, T. Tobase, T. Togashi, **S. J. Tracy**, Y. Umeda, L. Wollenweber, T. Yabuuchi, U. Zastrau, K. Appel, *Evidence of shock-compressed stishovite above 300 GPa*, Sci Rep. 10, 10197 (2020).

R. Briggs, F. Coppari, M. G. Gorman, R. F. Smith, **S. J. Tracy**, A. L. Coleman, A. Fernandez-Pañella, M. Millot, J. H. Eggert, and D. E. Fratanduono, *Measurement of body-centered cubic gold and melting under shock compression*, Phys. Rev. Lett 123, 045701 (2019).

**S. J. Tracy**, R. F. Smith, J. K. Wicks, D. Fratanduono, C. Bolme, A. Gleason, S. Speziale, K. Appel, V. Prakapenka, A. Fernandez Pañella, H. K. Lee, B. Nagler, A. McKinnon, F. Tavella, J. H. Eggert and T. S. Duffy, *In situ observation of phase transition in silicon carbide under shock compression using pulsed x-ray diffraction*, Phys. Rev. B 99, 214106 (2019).

**S. J. Tracy**, S. J. Turneure and T. S. Duffy, *In situ x-ray diffraction of shock compressed fused silica*, Phys. Rev. Lett. 120, 135702 (2018).

R. Dutta, **S. J. Tracy**, C. V. Stan, V. B. Prakapenka, R. J. Cava and T. S. Duffy, *Phase Stability of Iron Germanate,  $\text{FeGeO}_3$  to 127 GPa*, Phys. Chem. Miner. 0342-1791 (2017).

L. Mauger, J. E. Herriman, O. Hellman, **S. J. Tracy**, M. S. Lucas, J. A. Muñoz, Yuming Xiao, Ji Li and B. Fultz, *Phonons and elasticity of cementite through the Curie temperature*, Phys. Rev. B 95, 024308 (2017).

F. C. Yang, J. A. Munoz, O. Hellman, L. Mauger, M. S. Lucas, **S. J. Tracy**, M. B. Stone, D. L. Abernathy, Yuming Xiao and B. Fultz, *Thermally-driven electronic topological transition in  $\text{FeTi}$* , Phys. Rev. Lett. 117, 076402 (2016).

**S. J. Tracy**, L. Mauger, H. L. Smith, J. Herriman, H. J. Tan, Y. M. Xiao and B Fultz, *Polaron mobility and disordering of the Na sublattice in  $\text{Na}_x\text{FePO}_4$* , Chem. Mater. 28, 3051 (2016).

**S. J. Tracy**, L. Mauger, H. J. Tan, J. A. Muñoz, Yuming Xiao, B. Fultz, *Polaron-ion correlations in  $\text{Li}_x\text{FePO}_4$  studied by x-ray nuclear resonant forward scattering at elevated pressure and temperature*. Phys. Rev. B 90, 094303 (2014).

L. Mauger, M. S. Lucas, J. A. Muñoz, **S. J. Tracy**, M. Kresch, Yuming Xiao, Paul Chow, and B. Fultz, *Nonharmonic phonons in  $\alpha$ -iron at high temperatures*. Phys. Rev. B 90, 064303 (2014).

Chen W. Li, Xiaoli Tang, J. A. Muñoz, J. B. Keith, **S. J. Tracy**, D. L. Abernathy, and B. Fultz, *Structural relationship between negative thermal expansion and quartic anharmonicity of cubic  $\text{ScF}_3$* , Phys. Rev. Lett. 107, 195504 (2011).

G. M. Schmiedeshoff, A. W. Lounsbury, D. J. Luna, **S. J. Tracy**, A. J. Schramm, S. W. Tozer, V. F. Correa, S. T. Hannahs, T. P. Murphy, E. C. Palm, A. H. Lacerda, S. L. Bud'ko, P. C. Canfield, J. L. Smith, J. C. Lashley, and J. C. Cooley, *Versatile and compact capacitive dilatometer*, Rev. Sci. Instrum. 77, 123907 (2006).

### **Professional Society Memberships**

American Geophysical Union

Mineralogical Society of America

American Physical Society