# Ehsan Gharib-Nezhad | CV

NASA Ames Research Center, Moffett Field, CA, 94035 USA [Nationality: US Citizen]

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## APPOINTMENTS

**Postdoctoral Research Fellow**, NASA Ames Research Center. 1/2020–1/2022
**Research Scientist**, Bay Area Environmental Research Institute. 09/2019–1/2020
**Research Assistant**, Arizona State University 05/2016–8/2019

## EDUCATION

**PhD, Exoplanetary Atmospheric Modeling / Spectroscopy**, Arizona State University, USA. 6/2019
Advisors: Drs. Micheal R. Line and James R. Lyons
**M.Sc. Physical Chemistry / Spectroscopy**, University of Tehran, Iran. 9/2013
Advisor: Dr. Alireza Shayesteh

## RESEARCH EXPERIENCE:

- **EXPERIMENT:**
  - **Simulate Exoplanet Atmospheres:** to characterize clouds and aerosols.
  - **Record High-Resolution Spectra** of atmospheric key absorbers, H2O and CH4 using FTIR spectrometers at Berkeley national lab to determine spectroscopic constants.
  - **Spectral Analysis** of diatomic and polyatomic molecules (i.e., CH4, CO, MgH, CaH, CaD).
- **THEORY:**
  - **Generating Opacities** for molecules such as water, metal hydrides/oxides (e.g., TiO, VO, FeH etc.) for exoplanet and astrophysics communities.
  - **Modelling Exoplanet/Brown-dwarf Atmospheres** using 1-D radiative-convective transfer codes to generate synthetic observational spectra for $HST$ and $JWST$ telescopes.
- **CREATE PUBLIC SPECTROSCOPY DATABASES:**
  - **$H_2O$ BT2 opacity** (including $H_2$ and Self-broadening) Link
  - **EXOPLINES opacity database** (including TiO, VO, SiO, TiH, FeH, CaH, MgH, CrH, AlH molecules) Link

## TECHNICAL SKILLS:

- **Spectrometers:**
  - ●●● FTIR / UV-Vis
  - ●●● Optical Spectros.
  - ●●○ Ellipsometry
  - ●●○ Plasma Discharge
  - ●○○ X-ray Diffraction
- **Spectroscopic Software:**
  - ●●● Level
  - ●●○ Pgopher
- **Atmospheric modeling:**
  - ●●○ Chimera
  - ●●○ Picaso
- **Supercomputers:**
  - ●●● Pleides (NASA)
  - ●●● Agave (Arizona)
- **Programming:**
  - ●●● Python
  - ●○○ Fortran

## PROFESSIONAL SOCIETIES & ACADEMIC SERVICES

**Peer Reviewer** AAS Journals, Icarus, A&A 2018-Present
**Proposal/Fellowship Reviewer** for FINESST 2020
**Chair assistant** at International Symposium on Molecular Spectroscopy 2018
**GPSA Research & Travel Grant Reviewer**, ASU 2016 – 2018

## AWARDS & Honors

**NASA Postdoc Fellowship Award** 2020
EXOPLINES Opacity Database: Bridging the Laboratory Pressure-Broadening Data to Exoplanet/Brown-Dwarf Spectroscopy.
**Nininger Student Travel Award**, Center for Meteorite Studies, ASU. 2016
**Graduate Research Support Program & JumpStart Grant**, PI 2016
Graduate and Professional Student Association, ASU.
**Summer Fellowship**, School of Molecular Sciences, ASU. 2014
**Ranked 89 out of ∼10,000 entrance exam takers for M.Sc. (top 1%)** 2010
**Ranked 6,800 out of ∼150,000 entrance exam takers for B.S.** 2005

## GRANTS

**Cycle 28 HST**, Co-I 2020
Title: Cycle 28 Program AR-16139 A Grid Idea: A New Comprehensive Self-Consistent Radiative-Convective Model Grid for Exoplanet Atmospheres.
**Cycle 27 HST**, PI 2019
Title: Composition Dependent Molecular Opacity Database for High-Metallicity Exoplanet Atmospheres.

## PUBLICATIONS

1. Mansfield, M., Line, M. Bean, J., Fortney, J. [...] **Gharib-Nezhad, E.** et al. *"A hot Jupiter spectral sequence with evidence for compositional diversity"*, Nature Astronomy, 2021 (In revision).

2. Wardenier, J.P., Parmentier, V., Lee, E.K.H., Line, M., **Gharib-Nezhad, E.** *"Decomposing the Iron Cross-Correlation Signal of the Ultra-Hot Jupiter WASP-76b in Transmission using 3D Monte-Carlo Radiative Transfer"*, MNRAS, 2021 (Accepted) Link.

3. **Gharib-Nezhad, E.**, Marley, M., Vissher, C., Batalha, N.E., Freedman, R.S., Lupu, R.E., *"Following the Lithium: Tracing Li-bearing Molecules Across Age, Mass, and Gravity in Brown Dwarfs"*, ApJ, 2021 (Accepted) Link.

4. Apai, D., Banzatti, A., Ballering, N. P., Bergin, E. A., [...] **Gharib-Nezhad, E.** et al. *"Planetary Habitability Informed by Planet Formation and Exoplanet Demographics"*, BAAS, 51, 475 (2019) Link.

5. **Gharib-Nezhad E.**, Iyer, A.R., Line, M.R., Freedman, R.S., Marley, M.S., Batalha, N.E., *"EXOPLINES: Molecular Absorption Cross-Section Database for Brown Dwarf and Giant Exoplanet Atmospheres"*, 2021, ApJS, 254 34 Link.

6. **Gharib-Nezhad, E.**, Heays, A.N., Bechtel, H.A., Lyons, J. R. *"H2-Induced Pressure Broadening and Pressure Shift in the P-Branch of the $\nu_3$ Band of CH4 from 300 to 655 K"* (2019) JQSRT, 239, 106649 Link.

7. **Gharib-Nezhad, E.**, M. R. Line *"The Influence of H2O Pressure Broadening in High-Metallicity Exoplanet Atmospheres"* (2019) ApJ, 872, 27 Link.

8. J. Fortney, T.D. Robinson, S. Domagal-Goldman [...] **Gharib-Nezhad, E.** et al. *"The Need for Laboratory Measurements and Ab Initio Studies to Aid Understanding of Exoplanetary Atmospheres."* (2019) Link.

9. Lyons, J. R., **Gharib-Nezhad, E.** & Ayres, T.R. *"Carbon isotope composition of the solar photosphere"* (2018) Nature Communication 9, 908 2018 Link.

10. Shayesteh, A., Alavi, S. F., Rahman, M., **Gharib-Nezhad, E.** (2017) *"Ab initio transition dipole moments and potentialenergy curves for the low-lying electronic states of CaH"*, Chem. Phys. Lett., 667, 345 Link.

11. **GharibNezhad, E.**, Shayesteh, A., & Bernath, P. F., *"Einstein A coefficients for rovibronic lines of the A $^2\Pi \rightarrow X^2\Sigma^+$ and $B'^2\Sigma^+ \rightarrow X^2\Sigma^+$ transitions of MgH"* (2013) MNRAS, 432, 2043 Link.

12. **GharibNezhad, E.**, Shayesteh, A., & Bernath, P. F., *"Fourier transform emission spectra of the A $^2\Pi \rightarrow X^2\Sigma^+$ and $B^2\Sigma^+ \rightarrow X^2\Sigma^+$ transitions of CaD"* (2012) J. Molec. Spec., 281, 47 Link.

## Selected Abstract Conferences

1. **E. Gharib-Nezhad**, M.R. Line & J. R. Lyons, *"Effect of Pressure Broadening on Emission and TransmissionSpectra of H2O Modeled for sub-Neptune/super-Earth exoplanets: An Application to JWST"* DPS49, Abstract id:149.19.2017J Link.

2. R. Lyons, **E. Gharib-Nezhad** & T. R. Ayres, *"The Carbon Isotope Composition of the Sun"*, 48th LPSC, id.2309.2017 Link.

3. **E. Gharib-Nezhad**, J. R. Lyons & D. P. Wright, *"Laboratory Simulation of Haze/Aerosol formation in warmand hot Jupiters"* DPS48/EPSC11, Abstract id:122.05.2017 Link.

4. **E. GharibNezhad**, J. R. Lyons & D. P. Wright *"Simulating Haze Particles in a H2-Rich Exoplanet Atmosphere with High Temperature Discharge Experiments"*, LPS, Abstract 2565.2016 Link.

## Selected Talks

1. "H2-induced pressure broadening and pressure shift in the P-branch of the $\nu_3$ band of CH4 from 300 to 655 K", Int. Symp. Molec. Spec., IL. 2019

2. "Opacity Data: The Need for Laboratory Measurements to Interpret Observational data", Bay Area Exoplanets Meeting 2019

3. "The influence of pressure broadening on Exoplanet Spectra" Other Worlds Laboratory, CA. 2018

4. "The Influence of Pressure Broadening on Exoplanet Atmosphere Spectra" NASA Ames, CA. 2018

5. "Simulating exoplanet hazes with high temperature discharge experiments", APS, AZ. 2016

## Teaching Experience

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| Physical Chemistry Lab (CHM 348), ASU | 2016-2017 |
| General Chemistry Lab (CHM113, CHM114), ASU | 2015-2016 |
| Physical Chemistry (CHM341), ASU | 2014 |
| Quantum Chemistry/Molecular Spectroscopy, University of Tehran | 2012 |

## Professional Development

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| Summer School The Other Worlds Laboratory (OWL), UCSC, CA. | 2018 |
| Workshop Swagelok Essentials Day of Training, Swagelok Southwest company, Phoenix, AZ. | 2017 |
| Winter School NExSS, Biosphere 2 in Oracle, AZ. | 2016 |
| Workshop Modern Vacuum Technology, LeRoy Solid state center, ASU, AZ. | 2015 |

## References

**Prof. Mark S. Marley** (Postdoc Adviser), Lunar and Planetary Laboratory (LPL), Univ. of Arizona
marley@lpl.arizona.edu, Home Page.
**Dr. Richard S. Freedman** (Postdoc Collaborator), SETI/NASA Ames Research Center
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**Prof. Michael R. Line** (PhD Adviser), School of Earth and Space Exploration, Arizona State Univ.
mrline@asu.edu, Home Page.
**Prof. James R. Lyons** (PhD Adviser), School of Earth and Space Exploration, Arizona State Univ.
jimlyons@asu.edu, Home Page.
**Dr. Alan N. Heays** (PhD Mentor) J. Heyrovsky Institute of Physical Chemistry, Cezch Republic.
alan.heays@jh-inst.cas.cz, Home Page.