

MATTHEW S. CLEMENT

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EDUCATION

2019 Ph.D. (Astrophysics), University of Oklahoma
Thesis: The Early Instability Scenario for Planet Formation in the Solar System
2017 M.S. (Physics), University of Oklahoma
2010 B.S. (Astrophysics, German), US Naval Academy

PROFESSIONAL APPOINTMENTS

08/2019 – Carnegie Postdoctoral Fellow
Carnegie Institution for Science: Earth and Planets Laboratory; Washington DC
05/2019 – 08/2019 Postdoctoral Fellow
University of Oklahoma; Norman, OK
08/2018 – 01/2019 Chateaubriand Graduate Fellow
Laboratoire d'Astrophysique de Bordeaux; Bordeaux, France
09/2017 – 08/2018 Blue Waters Graduate Fellow
National Center for Supercomputing Applications; Champaign, IL
08/2015 – 05/2019 Graduate Research Assistant
University of Oklahoma; Norman, OK

US NAVY EXPERIENCE

06/2020 – Lieutenant Commander (US Naval Reserves)
05/2015 – 06/2020 Lieutenant (US Naval Reserves)
01/2014 – 03/2015 Assistant Engineer Officer (USS TOPEKA)
11/2013 – 01/2014 Prospective Nuclear Engineering Officers' Course
03/2012 – 11/2013 Chemistry and Radiological Controls Assistant (USS TOPEKA)
08/2011 – 02/2012 Nuclear Power Training Unit
04/2011 – 07/2011 Submarine Officer Basic Course
10/2010 – 04/2011 Navy Nuclear Power School
07/2010 – 08/2010 Navy Dive School
05/2010 – Top Secret Security Clearance

GRANTS AND ALLOCATIONS

As PI: 2020 74,000 node hour supplemental allocation on TACC Frontera (NSF)
2020 41,420 node hour allocation on TACC Frontera (NSF)
2020 2,890,000 SU allocation on PSC Bridges and SDSC Comet (XSEDE)
2020 8,000 node hour start-up allocation on TACC Frontera (NSF)
2019 52,500 SU start-up allocation on PSC Bridges (XSEDE)
2019 100,000 node hour allocation on Blue Waters (NCSA)
2019 ~\$220,000 Carnegie Postdoctoral Fellowship

2018	€4,200 in fellowships (Embassy of France)
2018	180,000 node hour allocation on Blue Waters (NCSA)
2017	\$50,000 and 100,000 node hour allocation in fellowships (NCSA)
2017	\$600 in travel grants (OU)

REFEREED JOURNAL ARTICLES

11 TOTAL; 9 FIRST AUTHOR

- 2021 *Born eccentric: Constraints on Jupiter and Saturn's pre-instability orbits*
Clement, M. S., Raymond, S.N., Kaib, N.A., Deienno, R., Chambers, J., and Izidoro, A., 2021 *Icarus*, [355](#)
- 2020 *Search for Nearby Earth Analogs. III. detection of eight new planets, four planet candidates, and confirmation of four planets around eleven nearby M dwarfs*
 Feng, F., Shectman, A., **Clement, M.S.**, Vogt, S., et al., 2020. *The Astrophysical Journal Supplement Series*, [250, 2: 29](#)
- The First Habitable Zone Earth-sized Planet from TESS. I: Validation of the TOI-700 system*
 Gilbert, E.A., Barclay, T., Schlieder, J.E., Quintana, E.V., et al., including **Clement, M.S.**, 2020. *The Astronomical Journal*, [160, 3: 116](#)
- Embryo formation with GPU acceleration: reevaluating the initial conditions for terrestrial accretion*
Clement, M. S., Kaib, N.A., and Chambers, J.E., 2020. *The Planetary Science Journal*, [1, 1: 18](#)
- Orbital precession in the distant solar system; further constraining the Planet Nine hypothesis with numerical simulations*
Clement, M. S., and Kaib, N.A., 2020. *The Astronomical Journal*, [159, 6: 285](#)
- A record of giant planet migration fossilized in the asteroid belt's orbital structure*
Clement, M. S., Morbidelli, A., Raymond, S.N., and Kaib, N.A., 2020. *Monthly Notices of the Royal Astronomical Society*, [492, 1: 56-60](#)
- 2019 *Dynamical constraints on Mercury's collisional origin*
Clement, M. S., Kaib, N.A., and Chambers, J.E., 2019. *The Astronomical Journal*, [157, 5: 208](#)
- The early instability scenario: terrestrial planet formation during the giant planet instability, and the effect of collisional fragmentation*
Clement, M. S., Kaib, N.A., Raymond, S.N. Chambers, J.E. and Walsh, K.J., 2019. *Icarus*, [321: 778-790](#)
- Excitation and Depletion of the Asteroid Belt in the Early Instability Scenario*
Clement, M. S., Raymond, S.N., and Kaib, N.A., 2019. *The Astronomical Journal*, [157, 1: 38](#)
- 2018 *Mars' growth stunted by an early giant planet instability*
Clement, M. S., Kaib, N.A., Raymond, S.N. and Walsh, K.J., 2018. *Icarus*, [311: 340-356](#)
- 2017 *Prevalence of chaos in planetary systems formed through embryo accretion*
Clement, M. S. and Kaib, N.A., 2017. *Icarus*, [288: 88-98](#)

MANUSCRIPTS IN PROGRESS

AVAILABLE ON REQUEST

Dynamical avenues for Mercury's origin I: the lone survivor of a primordial generation of short-period proto-planets.

Clement, M.S., Chambers, J.E., and Jackson, A.P., *The Astronomical Journal*, in review

Dynamical avenues for Mercury's origin II: in-situ formation in the inner terrestrial disk.

Clement, M.S., and Chambers, J.E., *The Astronomical Journal*, in review

Stability of Neptune's distant resonances in the presence of Planet Nine

Clement, M.S., and Sheppard, S.S., in preparation

The potential for delayed planetesimal bombardment to deliver volatiles and reconstitute atmospheres on potentially habitable, M-dwarf-hosted planets

Clement, M.S., Quintana, E.V., Quarles, B.L., in preparation

NON-REFEREED ARTICLES AND ABSTRACTS

AS FIRST AUTHOR

2021 *Small, dense and isolated: Growing better Mercury analogs with in-situ accretion and dynamical instabilities*

Clement, M.S., Chambers, J.E. Lunar and Planetary Science Conference, Virtual

2019 *The Early Instability Scenario for Planet Formation in the Solar System*

Clement, M.S., [Blue Waters 2019 Annual Report](#) (Blue Waters Computing, 2019)

Constraining Saturn's Final Migration with GPU acceleration

Clement, M. S., Morbidelli, A., Raymond, S.N., and Kaib, N.A., 2019. [European Planetary Science Congress](#) and AAS Division of Planetary Sciences Joint Meeting, Geneva Switzerland

2018 *How the solar system survived a violent epoch of instability*

Clement, M.S., [Blue Waters 2018 Annual Report](#) (Blue Waters Computing, 2018)

What is behind Mars' stunted growth?

Clement, M. S., 2018. Article, [Science Trends](#)

FELLOWSHIPS AND AWARDS

2020	Science Technology and Policy Fellowship (AAAS, declined)
2019	Jens R. Nielsen Prize for outstanding thesis (OU)
2018	Chateaubriand Fellowship (Embassy of France)
2017	Graduate Student Senate Travel Grant (OU)
2017	Blue Waters Graduate Fellowship (NCSA)
2016	Provost's Certificate of Distinction in Teaching (OU)
2010	Sigma Pi Sigma (USNA)
2009	Phi Sigma Iota (USNA)
2006	Robert T. Nahas Scholarship (Oakland Coliseum)
2005	Mathematics Signature Award (Caltech Alumni Association)

INVITED TALKS, SEMINARS AND COLLOQUIA

01/2020	Carnegie Institution for Science Astronomy Seminar; Virtual
12/2020	Georgia Institute of Technology CRA Colloquium; Virtual
11/2019	Carnegie Institution for Science Planets Reading Group; Washington, DC
10/2019	Carnegie Institution for Science Astronomy Seminar; Washington, DC
09/2019	STScI Exoplanets, Star and Planet Formation Seminar; Baltimore, MD
10/2018	Observatoire de la Côte d'Azur Seminar; Nice, France
09/2018	Laboratoire d'Astrophysique de Bordeaux Seminar; Bordeaux, France

CONFERENCE PRESENTATIONS

12/2020	Chesapeake Bay Area Exoplanets Meeting; Virtual
10/2020	AAS Division of Planetary Sciences Meeting; Virtual
08/2020	AAS Division of Dynamical Astronomy Meeting; Virtual
08/2020	AAS Division of Dynamical Astronomy Meeting; Virtual (<i>POSTER</i>)
01/2020	Chesapeake Bay Area Exoplanets Meeting; Washington, DC
01/2020	AAS General Meeting; Honolulu, HI
09/2019	European Planetary Science Congress - AAS Division of Planetary Sciences Joint Meeting, Geneva, Switzerland
06/2019	AAS Division of Dynamical Astronomy Meeting; Boulder, CO
06/2019	The Main Belt: A Gateway to the Formation and Evolution of the Early Solar System Workshop; Sardinia, Italy
06/2018	NCSA Blue Waters Symposium for Petascale Science and Beyond; Sunriver, OR
06/2018	NCSA Blue Waters Symposium for Petascale Science and Beyond; Sunriver, OR (<i>POSTER</i>)
04/2018	AAS Division of Dynamical Astronomy Meeting; San Jose, CA
10/2017	AAS Division of Planetary Sciences Meeting; Provo, UT
06/2017	AAS Division of Dynamical Astronomy Meeting; London, United Kingdom
01/2017	AAS General Meeting; Grapevine, TX

PUBLIC TALKS

10/2020	Carnegie Earth and Planets Laboratory Lunch & Learn Series; Virtual
02/2020	Carnegie Institution of Washington Lunch & Lecture Series; Washington, DC
05/2018	Science Museum Oklahoma; Oklahoma City, OK

WORKSHOP PARTICIPATION

03/2020	Computational and Data Science at Carnegie; Washington DC
01/2020	Chesapeake Bay Area Exoplanets Meeting; Washington, DC
11/2019	SEEC Symposium: Rocky Exoplanets in the Era of JWST: Theory and Observation; Greenbelt, MD
10/2019	Carnegie Exoplanetary Worlds Workshop; Washington, DC
09/2019	Chesapeake Bay Area Exoplanets Meeting; Newark, DE

SELECTED PRESS

11/2020	<i>Hoth-like frozen planet probably kicked out of the solar system billions of years</i>
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	ago, SIFY Wire
10/2020	Where were Jupiter and Saturn born? Carnegie press release
01/2020	Planetary turmoil unleashed during Solar System infancy, Science
11/2019	'Dirty' Collisions Shed Light on Planet Formation, Space.com
12/2018	These dusty young stars are challenging the rules of planet building, Nature
05/2018	The giant planets in the solar system stunted the growth of Mars, Universe Today
05/2018	An OU study explains why Mars growth stunted by early giant planetary instability, OU press release
04/2018	Why Mars turned into a Planetary Runt, Forbes

RESEARCH MENTORING

2020 – Nick Kartvedt, *undergraduate student*, US Naval Academy

TEACHING EXPERIENCE

2016 Astronomy: Exploring the Universe (3 sections)
 2015 Astronomy: Exploring the Universe (3 sections)

MEMBERSHIP AND SERVICE

Journal Referee: The Astrophysical Journal (*ApJ*, 1), The Astronomical Journal (*AJ*, 1), Astronomy and Astrophysics (*A&A*, 1), Icarus, (1), Monthly Notices of the Royal Astronomical Society (*MNRAS*, 2)

Panelist: NASA Review Panel (1)

External Reviewer: NASA *FINESST* (graduate research program), XSEDE EMPOWER (undergraduate research program)

Membership: American Astronomical Society (AAS): Division on Dynamical Astronomy (DDA), Division on Planetary Science (DPS)

07-2020 – Carnegie EPL Astronomy Journal Club Coordinator
 11/2019 – Carnegie Institution of Washington Library Committee
 09/2019 – Carnegie Academy for Science Education (outreach program)
 08/2015 – 05/2019 Lunar Sooners (student run educational outreach program)

LANGUAGES

English Native
 German Fluent (DoD Standardized Test)

REFERENCES

Assistant Professor [Nathan Kaib](#); University of Oklahoma: Ph.D. Advisor
 Dr. [John Chambers](#); Carnegie Institution for Science: Postdoctoral Advisor
 Dr. [Sean Raymond](#); Laboratoire d'Astrophysique de Bordeaux: co-Thesis Supervisor