Dr. Néstor Espinoza

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Education

Pontificia Universidad Católica de Chile (PUC) 2012 — 2017
Ph. D. in Astrophysics (*summa cum laude*)
Advisor: Dr. Andrés Jordán

Pontificia Universidad Católica de Chile (PUC) 2007 — 2012
Licenciate in Astronomy (*summa cum laude*)
Advisor: Dr. Andrés Jordán

Fellowships & Awards

IAU-Gruber Fellowship 2018
Fellowship awarded by The Gruber Foundation, selected by the International Astronomical Union (IAU, 25,000 USD prize for research).

Bernoulli Fellowship 2017— 2019
Joint position between the Max-Planck-Institut für Astronomie (MPIA) and the University of Bern.

100 Young Chilean Leaders 2017
Selected as one of the 100 leaders under 35 by `El Mercurio` newspaper.

Adelina Gutiérrez Travel Grant 2017
Research stipend awarded by the Chilean Astronomical Society.

PUC Young Student Leader 2016
Yearly recognition given to 20 students from the university.

Kavli Summer Program in Astrophysics Fellowship 2016
Granted to 17 PhD students around the world.

People's Choice Award 2014
Awarded at the Three Minute Thesis® Competition at PUC.

Distinguished Graduate Student Award 2014
Yearly award granted by the Chilean Astronomical Society.

CONICYT Graduate Research Fellowship 2013—2017
Fellowship awarded by the Chilean Ministry of Education.

Grants

JWST Cycle 1 General Observers (GO) Program 2021B — present
160,000+ USD awarded to the project "The First Near-infrared Spectroscopic Phase-curve of a Super-Earth" (PI: Espinoza; GO 2159)

JWST Cycle 1 General Observers (GO) Program 2021B — present
150,000+ USD awarded to the project "Exploring the Morning and Evening Limbs of a Transiting Exoplanet" (PI: Espinoza; GO 2113)

JWST Cycle 1 General Observers (GO) Program 2021B — present
80,000+ USD awarded to the project "TOI-178: the best laboratory for testing planetary formation theories" (PI: Hooton; US Admin-PI: Espinoza; GO 2319)

STScI Director's Discretionary Funds (DDRF) 2020B — present
60,000+ USD awarded as seed funding for the project "Towards an Exoplanet Census in the Cloud" (PI: Espinoza).

TESS Cycle 3 Guest Investigator Program 2020B — present
40,000 USD allocated to the project "Towards Constraints On Morning And Evening Terminators Of Distant Worlds With TESS" (PI: Espinoza).

Software

Selected software under active development:

juliet — a versatile tool for transiting and non-transiting exoplanetary systems 2019—present
Lead developer | juliet.readthedocs.io

ExoCTK — the Exoplanet Characterization ToolKit 2020—present
Science lead | exoctk.readthedocs.io

Transit Spectroscopy 2021—present
Lead Developer | github.com/nespinoza/transitspectroscopy

tepspec — a pipeline for multi-object transit spectroscopy 2016—present
Lead developer | github.com/nespinoza/tepspec

abeec — an Approximate Bayesian Computation sampler 2021—present
Lead developer | github.com/nespinoza/abeec

limbdarkening — software to compute stellar limb-darkening from model stellar atmospheres 2015—present
Lead developer | github.com/nespinoza/limbdarkening

Telescope time allocation

Selected programs as PI:

Exploring the Morning and Evening Limbs of a Transiting Exoplanet 2021—present
15.6 hours of telescope time.
James Webb Space Telescope (JWST).
Program ID: GO 2113.

The First Near-Infrared Spectroscopic Phase-curve of a Super-Earth 2021—present
14.9 hours of telescope time.
James Webb Space Telescope (JWST).
Program ID: GO 2159.

Unveiling exoplanet atmospheres with "twin" (exo)planets 2018—2019
12 hours of telescope time.
8.4m Large Binocular Telescope, Mount Graham, AZ, USA.
Proposal ID: DE-2018B-13.

Radial-velocity confirmation of K2 low-mass planet candidates 1/2017—9/2017
6 nights of telescope time.
ESO 3.6m Telescope, La Silla Observatory, Chile.
Proposal ID: 099.C-0526.

Variability monitoring of ACCESS Targets 1/2016—6/2016
50 hours of telescope time.
Las Cumbres Observatory GTN (1m telescopes).
Proposal ID: CN2016A-41.

ACCESS – The Arizona-CfA Catolica Exoplanet Spectroscopy Survey 6/2015—1/2016
8 nights of telescope time.
Magellan 6.5m Telescope, Las Campanas Observatory, Chile.
Proposal IDs: CN2015B-27, 2015A-78, 2014B-41, 2014A-68.

Publication List

First and second author (student/mentee-led marked in **blue**):

1. **Espinoza**, Ubeda, Birkmann et al.: *Spectroscopic Time-series Performance of JWST/NIRSpec from Commissioning Observations*, Publications of the Astronomical Society of the Pacific (2022), in press.
2. Fu, **Espinoza**, Sing, et al.: *Water and an escaping helium tail detected in the hazy and methane-depleted atmosphere of HAT-P-18b from JWST NIRISS/SOSS*, The Astronomical Journal (2022), in press.
3. Allen, **Espinoza**, Jordán: *ACCESS: Tentative Detection of H2O in the Ground-based Optical Transmission Spectrum of the Low-density Hot Saturn HATS-5b*, The Astronomical Journal (2022), vol. 164, 153.
4. Patel *&* **Espinoza**: *Empirical Limb-darkening Coefficients and Transit Parameters of Known Exoplanets from TESS*, The Astronomical Journal (2022), vol. 163, 5.

5. Rackham, **Espinoza**, Berdyugina et al.: *Final Report for SAG 21: The Effect of Stellar Contamination on Space-based Transmission Spectroscopy*, Report Submitted to NASA on January 2022; arXiv:2201.09905.
6. **Espinoza**, Pallé, Kemmer et al.: *A transiting, temperate mini-Neptune orbiting the M dwarf TOI-1759 unveiled by TESS*, The Astronomical Journal (2022), vol. 163, 3.
7. **Espinoza** & Jones: *Constraining Mornings and Evenings on Distant Worlds: A new Semianalytical Approach and Prospects with Transmission Spectroscopy*, The Astronomical Journal (2021), vol. 162, 4.
8. Jones & **Espinoza**: *catwoman: A transit modelling Python package for asymmetric light curves*, Journal of Open Source Software (2020), 5, 2382.
9. Yan, **Espinoza**, Molaverdikhani, et al.: *LBT transmission spectroscopy of HAT-P-12b. Confirmation of a cloudy atmosphere with no significant alkali features*, Astronomy & Astrophysics (2020), 642, 98.
10. **Espinoza**, Brahm, Henning, et al.: *HD 213885b: A transiting 1-day-period super-Earth with an Earth-like composition around a bright ($V = 7.9$) star unveiled by TESS*, Monthly Notices of the Royal Astronomical Society (2020), 491, 2, 2982.
11. **Espinoza**: *On the Transit Probability of the Habitable-zone Exoplanet GJ 357d*, Research Notes of the American Astronomical Society (2019), vol. 3, 8.
12. **Espinoza**, Kossakowski & Brahm: *Juliet: a versatile modelling tool for transiting and non-transiting exoplanetary systems*, Monthly Notices of the Royal Astronomical Society (2019), vol. 490, 2262.
13. Sandford, **Espinoza**, Brahm, et al.: *Estimation of singly transiting K2 planet periods with Gaia parallaxes*, Monthly Notices of the Royal Astronomical Society (2019), vol. 489, 3149.
14. Kossakowski, **Espinoza**, Brahm, et al.: *TOI-150b and TOI-163b: two transiting hot Jupiters, one eccentric and one inflated, revealed by TESS near and at the edge of the JWST CVZ*, Monthly Notices of the Royal Astronomical Society (2019), vol. 490, 1094.
15. **Espinoza**, Hartman, Bakos, et al.: *HATS-54b-HATS-58Ab: five new transiting hot Jupiters including one with a possible temperate companion*, The Astronomical Journal (2019), vol. 158, 2, 63.
16. Brahm, **Espinoza**, Jordán, et al.: *HD 1397b: A Transiting Warm Giant Planet Orbiting A V = 7.8 mag Subgiant Star Discovered by TESS*, The Astronomical Journal (2019), vol. 158, 45.
17. Brahm, **Espinoza**, Rabus, et al.: *K2-161b: a low-density super-Neptune on an eccentric orbit*, Monthly Notices of the Royal Astronomical Society (2019), vol. 483, 2.
18. **Espinoza**, Rackham, Jordán, et al.: *ACCESS: A featureless optical transmission spectrum for WASP-19b from Magellan/IMACS*, Monthly Notices of the Royal Astronomical Society (2019), vol. 482, 2.
19. **Espinoza**: *Efficient Joint Sampling of Impact Parameters and Transit Depths in Transiting Exoplanet Light Curves*, Research Notes of the American Astronomical Society (2018), vol. 2, 4, 209.
20. Jordán & **Espinoza**: *An Alternative Derivation of the Analytic Expression of Transmission Spectra*, Research Notes of the American Astronomical Society (2018), vol. 2, 149.

21. Brahm, **Espinoza**, Jordán, et al.: *K2-232 b: a transiting warm Saturn on an eccentric $P = 11.2$ d orbit around a $V = 9.9$ star*, Monthly Notices of the Royal Astronomical Society (2018), vol. 477, 2572.
22. **Espinoza**, Fortney, Miguel, et al.: *Metal enrichment leads to low atmospheric C/O ratios in transiting giant exoplanets*, Astrophysical Journal Letters (2017), vol. 838, L9.
23. Rackham, **Espinoza**, Apai, et al.: *ACCESS I: An Optical Transmission Spectrum of GJ 1214b Reveals a Heterogeneous Stellar Photosphere*, The Astrophysical Journal (2017), vol. 834, 151.
24. **Espinoza**, Rabus, Brahm, et al.: *EPIC 220504338b: A dense hot-Jupiter transiting a solar analogue*, Monthly Notices of the Royal Astronomical Society (2017), vol. 471, 4374.
25. **Espinoza**, Brahm, Jordán et al.: *Discovery and Validation of a High-Density sub-Neptune from the K2 Mission*, The Astrophysical Journal (2016), vol. 830, 43.
26. **Espinoza**, Bayliss, Hartman et al.: *HATS-25b through HATS-30b: A Half-dozen New Inflated Transiting Hot Jupiters from the HATSouth Survey*, The Astronomical Journal (2016), vol. 152, 108.
27. **Espinoza** & Jordán: *Limb darkening and exoplanets - II. Choosing the best law for optimal retrieval of transit parameters*, Monthly Notices of the Royal Astronomical Society (2016), vol. 457, 3573.
28. **Espinoza** & Jordán: *Limb darkening and exoplanets: testing stellar model atmospheres and identifying biases in transit parameters*, Monthly Notices of the Royal Astronomical Society (2015), vol. 450, 1879.
29. Jordán, **Espinoza**, Rabus et al.: *A Ground-based Optical Transmission Spectrum of WASP-6b*, The Astrophysical Journal (2013), vol. 778, 184.

Selected co-authored publications (full list of 120+ papers in ADS; h-index: 33):

- Schlawin, Beatty, Brooks et al. (including **Espinoza**): *JWST NIRCam Defocused Imaging: Photometric Stability Performance and How it Can Sense Mirror Tilts*, Publications of the Astronomical Society of the Pacific (2022), in press.
- Pontoppidan, Barrientes, Blome et al. (including **Espinoza**): *The JWST Early Release Observations*, The Astrophysical Journal (2022), 936, 14.
- The JWST Transiting Exoplanet Community Early Release Science Team (including **Espinoza**): *Identification of carbon dioxide in an exoplanet atmosphere*, Nature (2022), in press.
- Trifonov, Brahm, **Espinoza** et al.: *A pair of warm giant planets near the 2:1 mean motion resonance around the K-dwarf star TOI-2202*, The Astronomical Journal (2021), 162, 6.
- Trifonov, Caballero, Morales et al. (including **Espinoza**): *A nearby transiting rocky exoplanet that is suitable for atmospheric investigation*, Science (2021), 371, 6533.
- Hobson, Brahm, Jordán et al. (including **Espinoza**): *A Transiting Warm Giant Planet around the Young Active Star TOI-201*, The Astronomical Journal (2021), 161, 5.
- Schlecker, Kossakowski, Brahm et al. (including **Espinoza**): *A Highly Eccentric Warm Jupiter Orbiting TIC 237913194*, The Astronomical Journal (2020), 160, 275.

- McGruder, Lopez-Morales, **Espinoza**, et al.: *ACCESS: Confirmation of No Potassium in the Atmosphere of WASP-31b*, The Astronomical Journal (2020), 160, 235.
- Jenkins, Díaz, Kurtovic et al. (including **Espinoza**): *An ultrahot Neptune in the Neptune desert*, Nature Astronomy (2020), 4, 1148.
- Bluhm, Luque, **Espinoza**, et al.: *Precise mass and radius of a transiting super-Earth planet orbiting the M dwarf TOI-1235: a planet in the radius gap?*, Astronomy & Astrophysics (2020), 639, 132.
- Jordán, Brahm, **Espinoza** et al.: *TOI-677b: A Warm Jupiter (P = 11.2 days) on an Eccentric Orbit Transiting a Late F-type Star*, The Astronomical Journal (2020), 159, 4.
- Weaver, Lopez-Morales, **Espinoza**, et al.: *ACCESS: A Visual to Near-infrared Spectrum of the Hot Jupiter WASP-43b with Evidence of H2O, but no evidence of Na or K*, The Astronomical Journal (2020), 159, 13.
- Jones, Brahm, **Espinoza** et al.: *HD 2685 b: a hot Jupiter orbiting an early F-type star detected by TESS*, Astronomy & Astrophysics (2019), vol. 625, A19.
- Bixel, Rackham, Apai et al. (including **Espinoza**): *ACCESS: Ground-based Optical Transmission Spectroscopy of the Hot Jupiter WASP-4b*, The Astronomical Journal (2019), vol. 157, 2, 68.
- Jordán, Brahm, **Espinoza** et al. : *K2-287 b: An Eccentric Warm Saturn Transiting a G-dwarf*, The Astronomical Journal (2019), vol. 157, 3, 100.
- Bean, Stevenson, Batalha et al. (including **Espinoza**): *The Transiting Exoplanet Community Early Release Science Program for JWST*, Publications of the Astronomical Society of the Pacific (2018), vol. 130, 114402.
- Jones, Brahm, **Espinoza** et al.: *A hot Saturn on an eccentric orbit around the giant star EPIC228754001*, Astronomy & Astrophysics (2018), vol. 613, A76.
- Brahm, Jordán & **Espinoza**: *CERES: A Set of Automated Routines for Echelle Spectra*, Publications of the Astronomical Society of the Pacific (2017), vol. 129, 973.
- Fraine, Deming, Benneke et al. (including **Espinoza**): *Water vapour absorption in the clear atmosphere of a Neptune-sized exoplanet*, Nature (2014), vol. 513, 526.

Invited Talks

Astrophysical and Planetary Sciences Colloquium, CU Boulder, Colorado, USA.	11/2022
Physics & Astronomy Colloquium, George Mason University, Virginia, USA.	11/2022
Physics and Astronomy Colloquium, Wayne State University, Michigan, USA (Virtual Colloquium).	10/2022
Astronomy Seminar, University of Sao Paulo, Brazil (Virtual Seminar).	04/2022

Ole Rømer Colloquium, Institute of Physics and Astronomy, Aarhus Universitet, Denmark (Virtual Colloquium).	03/2022
Astronomy and Space Physics Seminar, Uppsala University, Sweden (Virtual Seminar).	10/2021
Atmospheres, Atmospheres! Do I look like I care about atmospheres? (Atmo 2021; Virtual Conference).	08/2021
Talk/Tutorial on JWST Data Analysis at the JWST ERS Hackaton (Virtual Workshop).	06/2021
Physics & Astronomy Seminar, Universidad Adolfo Ibañez, Santiago, Chile (Virtual Seminar).	04/2020
Carnegie DTM Astro Seminar, Carnegie DTM, Washington DC, USA.	01/2020
Chesapeake Bay Area Exoplanet Meeting, Carnegie DTM, Washington DC, USA.	01/2020
Planetary and exoplanetary Astronomy Lunch Seminar, University of Maryland, College Park, USA.	11/2019
Talk/Tutorial on JWST Proposal Planning tools at "Rocky Exoplanets in the era of JWST", NASA Goddard, Greenbelt, USA.	11/2019
Colloquium Talk, Instituto de Física, Facultad de Ciencias, Pontificia Universidad Católica de Valparaíso, Valparaíso, Chile.	05/2019
Seminar Talk, Departamento de Ciencias Físicas, Facultad de Ciencias Exactas, Universidad Andrés Bello, Santiago, Chile.	05/2019
Seminar Talk, Departamento de Astronomía, U. de Chile, Santiago, Chile.	05/2019
Seminar Talk, Space Telescope Science Institute (STScI), Baltimore, USA.	01/2019
Astronomical Time Series 2019, MPIA, Heidelberg, Germany.	01/2019
Königstuhl Colloquium, MPIA, Heidelberg, Germany.	05/2018
Atmospheres of Disks and Planets Workshop, Ringberg Castle, Germany.	04/2017
CSH Seminar, Center for Space and Habitability, Bern, Switzerland.	01/2017
Stars and Planets Seminar, Harvard-Smithsonian CfA, Boston, USA.	11/2016

Disks and Planets Seminar, Universidad Diego Portales, Santiago, Chile.	08/2016
Kavli Summer Program Seminar, UCSC, Santa Cruz, USA.	07/2016
Planet and Star Formation Coffee Talk, MPIA, Heidelberg, Germany.	07/2015
Instituto de Astrofísica de Canarias Seminar, Tenerife, Spain.	07/2015
Joint OSU-PUC Workshop Talk, Ohio State University, Columbus, USA.	05/2014
ORIGINS Seminar, Center for Astrobiology, University of Arizona, Tucson, USA.	03/2014
XI Chilean Astronomical Society Annual Science Meeting, San Esteban, Chile.	01/2014
First International Meeting in Astrostatistics in Valparaiso, Valparaiso, Chile.	05/2013

Service

Member of the "Towards Other Earths III: The Planet-Star connection" Conference SOC.	2022-Present
Member of the "Planetary Systems and the Origins of Life in the Era of JWST" STScI Spring Symposium SOC.	2022- Present
Member of the "Towards the Comprehensive Characterization of Exoplanets" STScI Spring Symposium SOC.	2020—2021
Co-chair of NASA's ExoPAG Study Analysis Group 21.	2019—2022
Member of the "Eclipsing Exoplanets 2020" conference SOC	2019—2020
Member of the SOC for MPIA's PSF 2018 Retreat	2018
Co-Lead (with E. Pallé) of the CARMENES-TESS Working Group	2018—present
Member of the CARMENES Exoplanet Atmospheres Working Group	2017—present
Reviewer for Nature Astronomy	2021—present
Reviewer for The Journal of Open Source Software	2018—present
Reviewer for The Astrophysical Journal	2018—present
Reviewer for The Astronomical Journal	2019—present
Reviewer for the Astronomy & Computing Journal	2018—present
Reviewer for Publications of the Astronomical Society of the Pacific	2017—present
Reviewer for the Argentinian Comission of Physical Sciences	

Member of NASA's FINESST fellowship selection panel

Member of STScI's fellowship selection committee

Member of CSH's fellowship selection committee

Outreach (Selected talks, events & positions)

Featured in PBS NOVA's "Ultimate Space Telescope" [link]	07/2022
Weekly astronomy show on chilean national radio station "Radio USACH" / Podcast "Razones Siderales" [link]	present
Universidad Nacional Autonoma de Mexico (UNAM)'s Public Keynote Lecture for the "Noche de Las Estrellas" (virtual) event [link]	11/2021
Briefing for Astronomy Educators as part of NASA's Universe of Learning [link]	8/2021
Public (virtual) lecture for the Universidad Católica del Maule, Chile [link]	6/2021
Public (virtual) lecture for the Sociedad de Astronomia del Caribe [link]	2/2021
Public (virtual) lecture for the Instituto de Astronomía of the Universidad Católica del Norte, Chile [link]	12/2020
Public lecture as part of STScI's Youth for Astronomy & Engineering Program, STScI, Baltimore, USA	10/2020
Public Lecture as part of the STScI "Public Lecture Series", STScI, Baltimore, USA [link]	03/2020
Scientist at the "Letters to a pre-scientist" Initiative	2019—2020
Scientist at the "Skype a Scientist" Initiative	2018—2021
Winner of the Heidelberg Max-Planck 2018 Science Slam, Heidelberg, Germany	09/2018
Public talk at Astronomy on Tap Heidelberg, Germany	02/2018
Weekly astronomy show on chilean national radio station "Futuro FM"	2015—2017
Monthly astronomy blog at the "Telescopios Chile" web portal	2015—2019
Public talk at Mosto Bar for "Beerstrophysics", Santiago, Chile	08/2017
Public talk for the "Asteroid Day", PUC, Santiago, Chile	06/2017
Talk at Google Chile, Santiago, Chile	05/2017
Public Talk at "Casa de la Cultura PAC", Santiago, Chile	05/2017
Public Talk at "Concierto Cielos", Santiago, Chile	03/2017
Founder and Coordinator of the "Bling Bling Universe" astronomy initiative	2009—2015
Director of the "Itinerant Physics" outreach program	2009—2013

Teaching

Invited Lecturer, Department of Physics & Astronomy, Johns Hopkins University — 2021B, 2022B
Course: "Planets, Life, and the Universe" (two lectures per semester)

Teacher, ProCredit Academy, Fürth, Germany — 2019A
Course: "The Universe Around Us" (35 hours per course, 4 courses)

Teacher, Center of Study and Development of Talent, Penta UC, Santiago, Chile — 2014A, 2014B, 2016A
Course: "Orders of Magnitude" (50 hours per course)

Invited Lecturer, Faculty of Economics and Business, U. de Chile, Santiago, Chile — 2016A, 2016B, 2017A, 2020A
Course: "Introduction to Science" (one lecture per semester)

Teaching Assistant:

ASP5408: Statistics for Astronomers (PUC)	2012—2016
AST0421: Experimental Astrophysics (PUC)	2014B
AST0212: Introduction to Data Analysis (PUC)	2014A
AST1525: Putting Numbers to the Earth and the Universe (PUC)	2014A
AST0311: General Astrophysics (PUC)	2013A
FIS101M: General Physics for the Military School (PUC)	2011B
FIS120: Electricity & Magnetism (UTFSM)	2010—2011

Student Supervision & Mentoring

Natalie Allen (PhD advisor) — 2020B — present
Project: "Constraining Stellar Contamination in Space Based Transit Spectroscopy" | Institution: Johns Hopkins University.

Patrick McCreery (First Year PhD student supervisor) — 2022B — present
Project: "Improving transit spectroscopy simulations for JWST" | Institution: Johns Hopkins University.

Yiwei Chai (First Year PhD student supervisor) — 2022B — present
Project: "Bayesian Evidence Calibration for exoplanet atmospheric detection" | Institution: Johns Hopkins University.

Gavin Wang (PURA research advisor; Undergraduate Student) — 2020B
Project: "A search for transit depth variability in *TESS* transiting exoplanets" | Institution: Johns Hopkins University.

Kevin Ortiz-Ceballos (Mentor; Undergraduate Student) — 2020B
Project: "Improving the precision of exoplanet atmospheric detections through pixel-level decorrelation" | Institution: STScI/University of Puerto Rico Río Piedras (STScI SASP Summer Program).

Kathryn Jones (Mentor; Master Student) 2019B
Project: "Extracting (transit) depths from morning and evening terminators in transit lightcurves" | Institution: MPIA, Germany/Oxford, United Kingdom (Summer Program).

Diana Kossakowski (Mentor; PhD Student) 2018 — 2019
Project: "Gaussian Processes applied to transit lightcurves and radial velocities" | Institution: MPIA, Germany.

Emily Sandford (Mentor; PhD Student) 2018 — 2019
Project: "Gaia *&* Singly Transiting Exoplanets" | Institution: PGIF Columbia/PUC Exchange Program, USA/Chile.

Jayshil Patel (Master Thesis Advisor) 2019A
Thesis title: "Study of the limb darkening effect using exoplanet transit light curves from TESS data" | Institution: S V National Institute of Technology, India.

Jennifer Fienco (Undergraduate Thesis Co-Advisor) 2019A
Thesis title: "Analitical Chemical Equilibrium for Exoplanetary Atmospheres" | Institution: Pontificia Universidad Católica de Chile, Chile.

Roy Van der Westhuizen (Undergraduate Thesis Co-Advisor) 2015B
Thesis title: "Virtual exoplanet laboratory: APIastro" | Institution: Pontificia Universidad Católica de Chile, Chile.