PhD genealogy of Jon Claerbout;
Ancestry and legacy.

Sjoerd de Ridder

ABSTRACT

PhD genealogy is the practice of tracing one's thesis adviser’s adviser, and so on. To first order this provides a lineage of academic teaching and thinking. For the Stanford Exploration Project’s 40th anniversary, I compiled Jon Claerbout’s academic lineage. The SEP is one of the world’s most infamous academic research groups in seismic imaging, and Jon Claerbout graduated many PhD students through this project himself. This report goes beyond the usual academic genealogy in that it also attempts to compile an academic legacy for Jon Claerbout. An online, and up-to-date copy of this academic genealogy, will be made available online.

INTRODUCTION

This paper outlines the PhD ancestry and legacy of Jon Claerbout, founder of the Stanford Exploration Project in 1973. First attempts to study this lineage started during my summer internship at BP in 2010, and the earliest generations were easily traced through the websites of the Massachusetts Institute of Technology. With the help of Wikipedia and various other university libraries, we trace the lineage to a variety of fields: geology, physics, mathematics, philosophy, theology, medicine and more. The website of the Mathematics PhD genealogy project\(^1\) proved particularly resourceful.

ANCESTRY

Jon received his PhD under Theodore Madden, himself a graduate of MIT. Several generations earlier we find the famous physicist Robert Millikan, conductor of the famous ”oil drop” experiment and a Nobel laureate, working at Caltech. Robert Millikan graduated with Albert Michelson, another Nobel laureate, and Michael Pupin at Columbia University. Another line traces to the geology department at the University of Wisconsin. This line started with Roland Irving, whose academic roots are unclear at this time. Irving’s arrival at Wisconsin marked the start of the geology program, one of the strongest of the nation. Irving is also the earliest known academic

\(^1\)http://genealogy.math.ndsu.nodak.edu/
adviser found in Jon’s PhD genealogy in the new world. Both Albert Michelson and Michael Pupin graduated at the University of Berlin, with none other than the famous Hermann von Helmholtz, whose last name is honored in the Helmholtz equation.

The earliest roots are not in fields of physics or mathematics at all, but rather in medicine, philosophy and theology. Studies at the time were less rigid; studies in philosophy would easily combine with work in mathematics. The PhD degree in its modern form did not exist and was not widely awarded either. The mathematics genealogy project traces student-teacher relationships in the absence of degrees. In this lineage we find Jakob Thomasius. At the University of Leipzig, Thomasius counted Gottfried Leibniz, inventor of calculus, among his students. Thomasius himself graduated with Gottfried Leibniz’s father, Friedrich Leibniz. Another notable academic was Johannes Argyropoulos, who obtained a degree in theology from the University of Padua. Argyropoulos later taught at the University of Florence where he is said to have found Leonardo da Vinci attending his lectures.

The earliest academic roots of Jon trace to Nilos Kabasilas, a fourteenth-century bishop of Thessalonika who was passionate about the philosophies of Saint Thomas.


IV Patrick M. Hurley, 1940 Massachusetts Institute of Technology, Investigations on the helium method of age determination. Advisors: Robley D. Evans (Va) and Warren J. Mead (Vb).

Va Robley D. Evans, California Institute of Technology. Advisor: Robert A. Millikan (VIa).


VIa Robert A. Millikan, Colombia University. Advisor: Michael I. Pupin (VIIa) and Albert Michelson (VIIb).


VIIIa Hermann von Helmholtz, Royal Friedrich-Wilhelm Institute. Advisor: Johannes Peter Müller (IXa).

VIIIb Charles R. Van Hise, 1892 University of Wisconsin. (‘USGS Monograph
19 on field investigations of the Penokee-Gogebic Iron Range’ might have been his thesis). Advisor: Roland D. Irving (IXb).

**IXa Johannes Peter Müller**, Bonn University. Advisor: Philipp Franz von Walther (Xa) and Karl Rudolphi (Xb).

**IXb Roland D. Irving** graduated from the Columbia University School of Mines in New York and arrived at the University of Wisconsin in 1870. Irving’s initial appointment, marking the beginning of the geology program, was in Mining and Metallurgy. In 1878 Irving became professor in a newly created Department of Mineralogy and Geology.


**XIIa Joseph Barth**, University of Vienna. Advisor: Anton von Störck (XIIIa).


**XIIIa Anton von Störck**, University of Vienna. Advisor: Gerard van Swieten (XIVa).


**XIVb Christian August Hausen**, University of Wittenberg. Advisor: Johann Christoph Wichmannshausen (XVb).


**XVb Johann Christoph Wichmannshausen**, University of Leipzig. Advisor: Otto Mencke (XVIb).

**XVIa Burchard de Volder**, University of Basel. Advisor: Franciscus de le Boë (XVIIa).


**XVIIa Franciscus de le Boë**, University of Basel. Advisor: Emmanuel Stupanus (XVIIIa).


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XX Theodor Zwinger, 1553 The College of France; MD at University of Padua 1559. Advisors: Petrus Ramus (XXIa) (The College of France), Bassiano Landi (XXIb) (University of Padua) and Vittore Trincavelli (XXIc) (University of Padua).

XXIa Petrus Ramus, 1536 The College of Navarre, Quaecumque ab Aristotele dicta essent, commentitia esse. Advisors: Johannes Sturmius (XXIIa) and Jacques Toussain (XXIIb).

XXIb Bassiano Landi, 1542 MD University of Padova. Advisors: Giovanni Battista della Monte (XXIId) and Vittore Trincavelli (XXIIId).

XXIIa Johannes Sturmius, 1527 Catholic University of Leuven. Advisors: Nicolas Clénard (XXIIId), Johannes Winter von Andernach (XXIIId).


XXIIc Giovanni Battista della Monte, University of Padova; MD University of Ferrara. Advisors: Marco Musuro (XXIIId) (University of Padova), Pietro Pomponazzi (XXIIId) (University of Padova) and Niccolò Leoniceno (XXIIId) (University of Ferrara).

XXIIId Vittore Trincavelli, MD University of Padova. Advisor: Pietro Pomponazzi (XXIIId).

XXIIIa Nicolas Clénard, 1515 Catholic University of Leuven; 1521 Theol. Dr. at Catholic University of Leuven. Advisors: Jacobus Latomus (XXIVa) and Jan van Campen (XXIVb).

XXIIIb Johannes Winter von Andernach, 1527 MD at Catholic University of Leuven; 1532 The College of Tréguier. Advisors: Rutger Rescius (XXIVc) and Jacobus Sylvius (XXIVd).

XXIIIc Guillaume Budé, 1486 University of Orléans; 1491 University of Paris. Advisors: Georgius Hermonymus and Janus Lascaris (XXIVe).

XXIIIId Marco Musuro, 1486 University of Firenze. Advisor: Janus Lascaris (XXIVe).

XXIIIId Pietro Pomponazzi, 1487 University of Padova. Advisors: Nicoletto Vernia (XXIVf) and Pietro Roccabonella (XXIVg).

XXIIIIf Niccolò Leoniceno, 1446 University of Vicenza; 1453 MD University of Padova. Advisor: Ognibene Bonisoli da Lonigo (XXIVh) (University of Vicenza), Pelope (University of Padova) and Pietro Roccabonella (XXIVg) (University of Padova).

XXIVa Jacobus Latomus, 1502 The College of Montaigu; 1519 Theol. Dr. at Catholic University of Leuven. Advisors: Jan Standonck (XXVa) (The College of Montaigu).

XXIVb Jan van Campen, Theol. Dr. at Catholic University of Leuven; 1519 University of Ingolstadt. Advisors: Mattheaeus Adriamus and Johann Reuchlin (XXVb).

XXIVc Rutger Rescius, 1513 at University of Paris. Advisor: Girolamo Aleandro (XXVc).
XXIVd Jacobus Sylvius, University of Paris; 1530 MD University of Montpellier. Advisors: Francois Dubois (XXVd) and Jean Tagault.

XXIVe Janus Lascaris, 1472 University of Padova. Advisors: Basilios Bessarion (XXVIIa) and Demetrios Chalcocondyles (XXVe).


XXIVg Pietro Roccabonella, MD University of Padova. Advisor: Gaetano da Thiene (University di Padova) and Sigismondo Polcastro (University di Padova).

XXIVh Ognibene Bonisoli da Lonigo, University of Mantova. Advisor: Vittorino da Feltre (XXVIIc).

XXVa Jan Standonck, 1474 The College of Sainte-Barbe; 1490 The College of Montaigu.

XXVb Johann Reuchlin, 1477 University of Basel; 1481 University of Poitiers. Advisors: Johannes Argyropoulos (XXVIa) and Jacob ben Jehiel Loans.

XXVc Girolamo Aleandro, 1499, 1508 Theol. Dr. Universit di Padova. Advisors: Moses Perez and Scipione Fortiguerra (XXVIb).

XXVd Francois Dubois, 1516 University of Paris.

XXVe Demetrios Chalcocondyles, Mystras; Roman Academies. Advisor: Theodoros Gazes (XXVIc).

XXVIa Johannes Argyropoulos, 1444 University of Padua; 1481 Theol. Dr. University of Poitiers. Advisor: Basilios Bessarion (XXVIIa).

XXVIIb Scipione Fortiguerra, 1493 University of Firenze. Advisor: Angelo Poliziano (XXVIIb).

XXVIc Theodoros Gazes, 1433 Constantinople; University of Mantova. Advisor: Vittorino da Feltre (XXVIIc).

XXVIIa Basilios Bessarion, 1436 Mystras. Advisor: Georgios Plethon Gemistos (XXIXa).

XXVIIb Angelo Poliziano, 1477 University of Firenze. Advisor: Marsilio Ficino (XXIXb) and Cristoforo Landino.

XXVIIc Vittorino da Feltre, 1416 University of Padova. Advisor: Guarino da Verona (XXIXc).

XXIXa Georgios Plethon Gemistos, 1380, 1393, Nómoi (Book of Laws). Advisor: Demetrios Kydones (XXXa) and Elissaeus Judaeus.

XXIXb Marsilio Ficino, 1462 University of Firenze. Advisor: Johannes Argyropoulos.

XXIXc Guarino da Verona. Advisor: Manuel Chrysoloras (XXXb).

XXXa Demetrios Kydones. Advisor: Nilos Kabasilas (XXXI).

XXXb Manuel Chrysoloras. Advisor: Demetrios Kydones (XXXa).

XXXI Nilos Kabasilas, a fourteenth-century bishop of Thessalonika who was passionate about the philosophies of Saint Thomas.
LEGACY

Here I attempt to compile an academic legacy of Jon Claerbout. By no means can this legacy be considered complete or flawless, and it is not meant to establish an authoritative or exhaustive document on adviser-advisee relationships of any of the people mentioned. The vast majority of Jon’s SEP students were trained in the SEP. Some of his students went on to advise and graduate many students themselves who in turn went on to have their own advisees.

I Jon F. Claerbout


Graduates at Stanford University:

1. Allen Stratton?
3. Lee Lu, 1972 Stanford University, The relation of local pressure fluctuations to large-scale meteorology and the simulation of acoustic-gravity waves in inhomogeneous media.
10. Ozgodan Yilmaz, 1979 Stanford University, Pre-Stack Partial Migration.
15. Robert W. Clayton, follows under (IIa).
20. Ira David Hale, follows under (IIb).
23. Daniel H. Rothman, follows under (IIc).
25. William S. Harlan, 1986 Stanford University, Signal/Noise Separation and Seismic Inversion
27. Peter Mora, follows under (IId).
28. Kamal Mansour Al-Yahya, 1987 Stanford University, Velocity Analysis by Iterative Profile Migration
30. Charles Hege Sword, 1987 Stanford University, Tomographic Determination of Interval Velocities from Reflection Seismic Data: The Method of Controlled Directional Reception.
33. Clement Kostov, 1990 Stanford University, Multichannel Seismic Experiment with a Drill-Bit Source.
34. Biondo L. Biondi, follows under (IIe).
35. Johannes A. van Trier, 1990 Stanford University, Tomographic Determination of Structural Velocities from Depth-migrated Seismic Data.
39. Lin Zhang, 1992 Stanford University, Imaging by the Wave Front Propagation Method,
41. Dave Nichols, 1994 Stanford University, Imaging in Complex Structures Using Band-limited Green’s Functions.
43. Alexander M. Popovici, 1995 Stanford University, Migration to Zero Offset in Variable Velocity Medium.
48. David E. Lumley, follows under (IIf).
51. Nizar Chemingui, 1999 Stanford University, Imaging irregularly sampled 3D prestack data.
52. Sean Crawley, 2000 Stanford University, Seismic trace interpolation with nonstationary prediction-error filters.
54. Sergey Fomel, follows under (IIg).
55. James Rickett, 2001 Stanford University, Spectral factorization of wavefields and wave operators.
56. Antoine Guitton, 2005 Stanford University, Multidimensional seismic noise attenuation.
57. Jesse Lomask, 2006 Stanford University, Seismic volumetric flattening and segmentation.
58. William Curry, 2008 Stanford University, Interpolation with prediction-error filters and training data.

IIa Robert W. Clayton
1981 Stanford University, Wavefield Inversion Methods for Refraction and Reflection Data.
Graduates at California Institute of Technology:
1. John Fawcett, 1984 California Institute of Technology with Herb Keller, I. Three dimensional ray-tracing and ray-inversion in layered media. II. Inverse scattering and curved ray tomography with applications to seismology.
3. Thomas Hearn, follows under (IIIa).
4. Eugene Humphreys, follows under (IIIb).
5. Ronan Le Bras, 1985 California Institute of Technology, Methods of multiparameter inversion of seismic data using the acoustic and elastic Born approximations.
6. John Vidale, follows under (IIIc).
7. John Louie, follows under (IIIId).
10. Hua-Wei Zhou, follows under (IIIe).
12. J. Huw Davies, follows under (IIIf).
16. Leo Eisner, 2001 California Institute of Technology, Reciprocity method in seismology.
19. Patricia Persaud, 2003 California Institute of Technology with Joann Stock, Images of early continental breakup in and around the Gulf of California and the role of basal shear in producing wide plate boundaries.
25. YoungHee Kim, follows under (IIIG).

Current students at California Institute of Technology:
1. Steve Skinner (with J. Stock)
2. Vanessa Heckman (with T. Heaton)
3. Sara Dougherty (with D. Helmberger)
4. Yiran Ma
5. Dunzhu Li

IIb Dave Hale
1983 Stanford University, Dip-moveout by Fourier transform.
Graduates at Colorado School of Mines:
Current students at Colorado School of Mines:
1. Simon Luo
2. Xinming Wu
3. Stefan Compton
4. Andrew Munoz

IIc Daniel H. Rothman
1985 Stanford University, Large Near-Surface Anomalies, Seismic Reflection Data, and Simulated Annealing.
Graduates at Massachusetts Institute of Technology:
1. Andrew K. Gunstens en, 1992 Massachusetts Institute of Technology, Lattice-Boltzmann studies of multiphase flow through porous media.
3. Einat Aharonov, 1996 Massachusetts Institute of Technology, Solid-fluid interactions in porous media: processes that form rocks.
5. Peter S. Dodds, 2000 Massachusetts Institute of Technology, Geometry of river networks.
9. David Forney, 2012 Massachusetts Institute of Technology, Emergent properties of heterogeneous decomposition networks
Current students at Massachusetts Institute of Technology:
1. Christopher Follet
2. Robert Yi

IIId Peter Mora
1987 Stanford University, Elastic Wavefield Inversion.
Graduates at Institut de Physique du Globe de Paris:
5. Frédéric Donze, 1994 Institut de Physique du Globe de Paris, Modélisation numérique de la déformation des roches comportement fragile par une méthode d’éléments discrets.

Graduates at The University of Queensland:
1. David Place 1999 The University of Queensland, A refined lattice solid model to simulate earthquakes and localisation phenomena using parallel computers.
2. Steffen Abe, 2002 The University of Queensland, Investigation of the influence of different micro-physics on the dynamic behaviour of faults using the lattice solid model.

Ilie Biondo L. Biondi
1990 Stanford University, Seismic Velocity Estimation by Beam Stack.

Graduates at Stanford University:
2. Paul Sava, follows under (IIIh).
5. Gabriel F. Alvarez, 2007 Stanford University, Attenuation of multiples in image space.
8. Jeff Shragge, follows under (IIIi).
9. Claudio Guerra, 2010 Stanford University, Migration-velocity analysis using image-space generalized wavefields

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Current students at Stanford University:
1. Adam Halpert
2. Xukai Shen
3. Sjoerd de Ridder
4. Mandy Wong
5. Yunyue Li
6. Yang Zhang
7. Ohad Barak
8. Chris Leader
9. Ali Almomin
10. Yi Shen
11. Noha Farghal
12. Musa Maharramov
13. Jason Chang
14. Taylor Dahlke
15. (Huy Le - masters)

IIf David E. Lumley

Graduates at Memorial University at Newfoundand:
1. Richard Wright, 2005, 4D Seismic Analysis of the Hubernia Oil Field, Grand Banks, Canada.

Graduates at the University of Western Australia:
1. Matt Saul, 2013 University of Western Australia with (IIf) and (IIIi), 4D seismic data analysis of reservoir gas movement.

Current students at the University of Western Australia:
1. Lisa Gavin, co-advised with (IIIi).
2. James Deeks, co-advised with (IIIi).
3. Mohammad Emami Niri
4. Rafael de Souza

IIg Sergey Fomel
2001 Stanford University, Three-dimensional seismic data regularization.

Graduates at The University of Texas at Austin:
1. Hesam Kazemeini, 2009 Uppsala University with C. Juhlin, Seismic Investigations at the Ketzin CO2 injection site, Germany: Applications to subsurface feature mapping and CO2 seismic response modeling.
2. William Burnett, 2011 The University of Texas at Austin, Multiazimuth velocity analysis using velocity-independent seismic imaging.
3. Xiaolei Song, 2012 The University of Texas at Austin, Application of Fourier finite differences and lowrank approximation method for seismic modeling and subsalt imaging.

Current students at The University of Texas at Austin:
1. Vladimir Bashkardin
2. Siwei Li
3. Parvaneh Karimi
4. Yangkang Chen
5. Junzhe Sun

IIIa Thomas M. Hearn
1985 California Institute of Technology, Crustal structure in Southern California from array data. Graduates at New Mexico State University:
1. Anca Rosca, 2000 New Mexico State University, Upper mantle structure beneath Nevada and southern California.

IIIib Eugene D. Humphreys
1985 California Institute of Technology with Brad Hager, Studies of the crust-mantle system beneath Southern California.
Graduates at the University of Oregon:
1. Alberto E. Patiño-Douce, 1990 University of Oregon under (IIIg) and A. Dana Johnson, Ultrametamorphism and anatexis of the continental crust: an experimental and theoretical study.
3. Glenn P. Biasi, 1994 University of Oregon, The streaming potential method applied to a low gradient hydrologic environment along the Mojave River, San Bernardino County, California.
6. Randy L. Palmer, 1997 University of Oregon, Studies of the kinematics and dynamics of southern California and northern Baja, Mexico.
7. Elizabeth H, Hearn, 1998 University of Oregon, Numerical models of lithosphere deformation: inferring rheology and structure from limited surface observations.

Current students at the University of Oregon:
1. David Adams
2. Noah Fay

IIIc John Vidale
1986 California Institute of Technology with Don Helmberger, Application of two-dimensional finite-difference wave simulation to earthquakes, earth structure, and seismic hazard.

Graduates at the University of California, Santa Cruz:
1. Ornella Bonamassa, 1995 University of California, Santa Cruz, Analysis of site effect and directional resonances and their relevance to seismic hazard.

Graduates at the University of California, Los Angeles:
1. Elizabeth Cochran, 2005 University of California, Los Angeles, Earthquake rupture initiation and fault structure: I. triggering of earthquakes by Earth tides: II. seismic anisotropy near the Hector Mine rupture: III. post-seismic displacements observed with InSAR.
2. Steven E. Persh, 2002 University of California, Los Angeles, Seismic investigations of core-mantle boundary structure and source properties of deep-focus earthquakes.

Graduates at the University of Washington:

Current students at the University of Washington:
1. Alicia Hotovek
2. Kate Allstadt

IIIId John N. Louie
1987 California Institute of Technology under (IIa), Seismic reflection experiments imaging the physical nature of crustal structures in southern California.

Graduates at the University of Nevada, Reno:
1. Sathish Kumar Pullammanappallil C., 1994 University of Nevada, Reno, Nonlinear optimization to estimate velocities and image reflectors from multi-offset seismic data.

Current students at the University of Nevada, Reno:
1. Gretchen Schmauder

IIIe Hua-Wei Zhou
1989 California Institute of Technology with Don Anderson, Travel time tomographic studies of seismic structures around subducted lithospheric slabs.

Current students while at the University of Houston:
1. Curtis A. Link, 1993 University of Houston, Crosshole seism. analysis for reservoir characterization & lithology indication.
2. Hongwei Wang, 1994 University of Houston, Analysis of ISC P-wave data and applications to the inference of velocity structure in the mantle.
4. Gemmeng Chen, 1995 University of Houston, Seismic modeling and imaging of heterogeneous media.
5. Marcos Guimaraes, 1998 University of Houston, Phys. model study of seis. acquisition and processing of vertical cable data.
6. Oong Koo Youn, 1998 University of Houston, AVO modeling and depth imaging with multiples.
7. Mohammed Al-Otaibi, 2002 University of Houston, Thin-bed AVO.
8. Khalid Al-Rufaii, 2002 University of Houston, Seismic tomography in areas associated with complex near-surface structures
10. Mike P. Thornton, 2006 University of Houston, Depth imaging of crustal scale seismic reflection surveys in Southern California.
11. Li Li, 2007 University of Houston, Mapping 3D crustal velocities of S. California by deformable layer tomography.
12. Alex Zhao, 2007 University of Houston, Classification detection of reservoir fluids with rock physics constraints.
13. Hongmei Cao, 2008 University of Houston, Reflection attenuation tomo. and ray count weighted multi-scale tomography.
18. Zhihui Zou, 2012 Texas Tech University, A seismologic study of the Three-Gorges Reservoir (TGR) region, China.

Current students at the University of Houston:
1. Chris Gantela

Current students at Texas Tech University:
1. Fang Yuan
2. Pan Deng

III J. Huw Davies
1989 California Institute of Technology under (IIa) and Dave Stevenson, Some problems in mantle structure and dynamics; Part 1. Inversion for depth variation of spectra of mantle compressional and shear velocity teterogeneity. Part 2. Physical model of source region of subduction zone volcanism.

Graduates at University of Liverpool:
2. Mark Rhodes, 1998 University of Liverpool, Mantle seismic tomography using P-wave travel times and a priori velocity models.
3. Carlos E. Izarra Teran, 2001 University if Liverpool under (IIIif) and xxx, The gravity anomaly of the subducted Nazca plate over the central Andes.

Graduates at Cardiff University:
1. David Oldham, Cardiff University, On the possibility of layered mantle convection - numerical simulation in a spherical geometry.
2. D. Rhodri Davies, follows under (IVa).
3. Martin Wolstencroft, Cardiff University, Understanding the thermal evolution of Earth.

Current students at Cardiff University:
1. Rebekah Lawton
2. Matthew Price

IIIg YoungHee Kim
2011 California Institute of Technology with J. Jackson, Seismic Properties of the Subduction System in Mexico.

Current students at Seoul National University:
1. Eunyoung Kim

IIIh Paul C. Sava
2004 Stanford University, Migration and velocity analysis by wavefield extrapolation.

Graduates at Colorado School of Mines:

Current Students at Colorado School of Mines:
1. Francesco Perrone
2. Esteban Diaz
3. Natalya Patrikeeva
4. Yuting Duan

IIIi Jeffrey Shragge
2009 Stanford University, Wave-equation migration in generalized coordinates.

Graduates at the University of Western Australia:
1. Matt Saul, 2013 University of Western Australia with (IIIe) and (IIf), 4D seismic data analysis of reservoir gas movement.

Current students at the University of Western Australia:
1. Lisa Gavin, co-advised with (IIf).
2. James Deeks, co-advised with (IIf).

IVa Rhodri Davies
2007, Cardiff University and Swansea University under (IIIf), Ken Morgan, Oubay Hassan and Perumal Nithiarasu, Applying Multi-Resolution Numerical Methods to Geodynamics.

Current students at Imperial College London:
1. Giuseppe Le-Voci

ACKNOWLEDGEMENTS

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