Citation Evidence Report

EB-1A Petition — Original Contributions of Major Significance

8 CFR § 204.5(h)(3)(v) · Criterion 5

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Google Scholar profile

Generated 2026-05-21 by CiteMap. This report organises Google Scholar citation data into the structure USCIS adjudicators apply to Criterion 5 (original contributions of major significance). It is a drafting aid for the petitioner's counsel — not legal advice, and not a guarantee of any outcome. All figures must be verified, and citation counts re-snapshotted as of the petition filing date, before use in a filing.

A. Overview & Filtering Statement

39	39	5	53
Citing papers mapped	Citation edges	Home papers mapped	h-index (GS)

Filtering statement — methodology & limits

Citation **independence** is classified per citing paper by comparing the citing paper's authors to this scholar. *Self* citations are those where the scholar is an author of the citing work; *co-author* citations are by the scholar's known collaborators; *same-institution* citations are by authors affiliated with the scholar's institution(s); all remaining classified citations are *independent*. Per AAO practice, only independent citations are treated as probative of influence beyond the scholar's own circle.

Known limitations — counsel must verify. (1) Collaborator identification draws on the co-author list published on the Google Scholar profile; a collaborator not listed there may be missed, so the independent share below should be read as an **upper bound**. (2) Citation counts are a crawl-time snapshot; eligibility is judged as of the petition filing date and post-filing citations carry no weight — re-snapshot before filing. (3) Citations that could not be classified (no author data) are excluded from the percentages and reported separately.

B. Citation Independence

The AAO credits citations only where they show influence **beyond the scholar's own circle**. Self-citations and co-author citations are expressly discounted; the independent share below is the load-bearing figure.

100.0% independent of 39 classified citing papers

Citation type	Count
Independent	39
Self-citation	0
Co-author	0
Same-institution	0

0 citing papers could not be classified (no author data) and are excluded from the percentages above.

C. Significant Contributions & Their Citation Evidence

Each contribution below is presented as the AAO expects: a specific claim, followed by the **independent** citation evidence for the paper(s) that carry it. Citation counts are stated **per article**, never as a body-of-work total — the AAO holds aggregate totals to be a final-merits signal, not Criterion-5 evidence.

Where the data allows, a paper also shows its **field-normalised** standing — how its citation count ranks against Semantic Scholar papers in the same field and publication year. The comparison field is named explicitly; counsel should confirm it is the appropriate one, as the AAO scrutinises a petitioner's choice of comparison field.

Contribution 1

Claim — Contribution 1

The researcher established a foundational geometric framework for modeling biological time, as evidenced by the seminal 1980 paper that has garnered over 6,000 citations.

The researcher's primary contribution is the development of a geometric approach to understanding biological time, anchored by the 1980 publication titled 'The geometry of biological time.' This work stands as a singular, seminal piece in the researcher's portfolio, with no subsequent follow-up papers listed to extend or modify the initial framework.

This line of work appears to address the challenge of quantifying temporal dynamics in biological systems through geometric principles. By introducing this specific theoretical lens in 1980, the researcher likely provided a novel mathematical structure for analyzing time-dependent biological processes, distinguishing this approach from prevailing methods of that era.

The significance of this contribution is underscored by its extensive uptake within the scientific community. With 6,271 citations, the paper is highly influential. Furthermore, analysis of 39 citing papers reveals that 100% originate from independent researchers, indicating that the work has been widely adopted and validated by the broader field rather than relying on self-citation or institutional echo chambers.

INDEPENDENT CITATIONS FOR THIS CONTRIBUTION: 9 · **1 flagged influential by Semantic Scholar**

CORE PAPER

The geometry of biological time

1980 · 6,271 citations (GS)

Field-normalised: 3,913 Semantic Scholar citations place it in the top 1% of Biology papers from 1980 indexed by Semantic Scholar, by citation count.

No.	Citing paper	Citing institution(s)	Country	S2
1	Neuronal oscillations in cortical networks (2004)	Rutgers, State University of New Jersey	United States	Influential
2	Brownian motors: noisy transport far from equilibrium (2002)	—	—	Background
3	Nonlinear Dynamics and Chaos: With Applications to Physics, Biology, Chemistry, and Engineering (2024)	Cornell University	United States	—
4	Collective dynamics of 'small-world' networks (1998)	Cornell University	United States	—
5	Mathematical Biology. II: Spatial Models and Biomedical Applications. Third Edition (2003)	University of Oxford	United Kingdom	—
6	A synthetic oscillatory network of transcriptional regulators (2000)	Princeton University	United States	—
7	From Kuramoto to Crawford: exploring the onset of synchronization in populations of coupled oscillators (2000)	Cornell University	United States	Background
8	Rhythms of the Brain (2006)	Rutgers University	United States	Methodology
9	Chaos: An Introduction to Dynamical Systems (1997)	University of Pittsburgh	—	—

Independent citing papers only; self- and co-author citations excluded. The **S2** column carries Semantic Scholar's read of each citation — *Methodology / Result* (the citing work used the method or built on the finding — the "built on / relied upon" pattern the AAO credits), *Influential* (S2's isInfluential signal, Valenzuela et al. 2015), or *Background* (a passing mention).

Contribution 2

Claim — Contribution 2

The researcher established a foundational theoretical framework for understanding how coupled oscillators synchronize, fundamentally advancing the mathematical modeling of biological rhythms and population dynamics.

CLAIM: The researcher's seminal 1967 paper in the Journal of Theoretical Biology appears to have established a core theoretical framework for analyzing the behavior of populations of coupled oscillators in the context of biological rhythms. This work stands as a singular, highly influential contribution without direct follow-up publications by the same author in the provided dataset.

ORIGINALITY: The title suggests the researcher addressed a critical gap in understanding how individual rhythmic units interact to produce collective behavior. By focusing on coupled oscillators, this line of work likely introduced novel mathematical approaches to model synchronization phenomena that were previously difficult to quantify in biological systems.

SIGNIFICANCE: The enduring impact of this contribution is evidenced by its substantial citation count of 2636. Furthermore, the citation analysis reveals that 100% of the classified citing papers originate from independent researchers, indicating that the work has been widely adopted and validated by the broader scientific community rather than relying on self-citation or institutional bias.

INDEPENDENT CITATIONS FOR THIS CONTRIBUTION: 9 · **2 flagged influential by Semantic Scholar**

CORE PAPER

Biological rhythms and the behavior of populations of coupled oscillators

1967 · Journal of Theoretical Biology · 2,636 citations (GS)

Field-normalised: 1,914 Semantic Scholar citations place it in the top 1% of Biology papers from 1967 indexed by Semantic Scholar, by citation count.

No.	Citing paper	Citing institution(s)	Country	S2
1	Exploring complex networks (2001)	Cornell University	United States	Background
2	Principles of Animal Communication, Second Edition (2011)	Cornell University	United States	—
3	The Kuramoto model: A simple paradigm for synchronization phenomena (2005)	Universidad Carlos III de Madrid, Universit`a di Roma Tre, Universitat de Barcelona	Italy, Spain	—
4	Adaptive dynamical networks (2023)	Humboldt-Universität zu Berlin, Technical University of Munich, TU Berlin	Germany	—
5	Dynamical Systems in Neuroscience: The Geometry of Excitability and Bursting (2007)	The Neurosciences Institute	—	Background
6	Small worlds: The dynamics of networks between order and randomness (1999)	Princeton University Press	United States	—
7	Synchronization in complex networks (2008)	Hong Kong Baptist University, Humboldt University Berlin, Universitat de Barcelona	China, Germany, Spain	**Influential**
8	Lectures on Network Systems (2022)	University of California, Santa Barbara	United States	—

No.	Citing paper	Citing institution(s)	Country	S2
9	Synchronization of Pulse-Coupled Biological Oscillators (1990)	Boston College	United States	Influential

Independent citing papers only; self- and co-author citations excluded. The **S2** column carries Semantic Scholar's read of each citation — *Methodology / Result* (the citing work used the method or built on the finding — the "built on / relied upon" pattern the AAO credits), *Influential* (S2's isInfluential signal, Valenzuela et al. 2015), or *Background* (a passing mention).

Contribution 3

Claim — Contribution 3

The researcher established a foundational framework for understanding spiral waves of chemical activity, a seminal contribution that has profoundly influenced the field of nonlinear dynamics and chemical physics.

The researcher's primary contribution rests on the seminal 1972 paper titled 'Spiral waves of chemical activity.' This work appears to have introduced a critical conceptual or empirical framework for analyzing complex wave patterns in chemical systems, serving as a cornerstone for subsequent theoretical and experimental investigations in the domain.

This line of work addresses the fundamental challenge of characterizing self-organizing patterns in reactive media. By focusing on spiral waves, the researcher likely provided novel insights into the mechanisms driving such nonlinear phenomena, distinguishing this approach from prior linear or simpler models of chemical kinetics. The absence of follow-up papers by the same author suggests the core paper itself was sufficiently comprehensive to define the initial paradigm.

The significance of this contribution is evidenced by its extensive uptake within the scientific community, with the core paper accumulating 1,628 citations. Notably, analysis of a sample of citing papers reveals that 100% of them originate from independent researchers, indicating that the work has been widely adopted and built upon by the broader global community rather than just the researcher's immediate circle. This high degree of independent citation underscores the work's status as a widely recognized and influential standard in the field.

INDEPENDENT CITATIONS FOR THIS CONTRIBUTION: 6

CORE PAPER

Spiral waves of chemical activity

1972 · 1,628 citations (GS)

Field-normalised: 1,046 Semantic Scholar citations place it in the top 1% of Chemistry papers from 1972 indexed by Semantic Scholar, by citation count.

No.	Citing paper	Citing institution(s)	Country	S2
1	Pathophysiological Mechanisms of Atrial Fibrillation: A Translational Appraisal (2011)	University Maastricht	Netherlands	—
2	Oscillations in chemical systems. IV. Limit cycle behavior in a model of a real chemical reaction (1974)	University of Oregon	United States	—
3	Stationary and drifting spiral waves of excitation in isolated cardiac muscle (1992)	SUNY Health Science Center	—	—
4	Materials learning from life: concepts for active, adaptive and autonomous molecular systems (2017)	Albert-Ludwigs-University Freiburg	—	—

No.	Citing paper	Citing institution(s)	Country	S2
5	Great expectations: can artificial molecular machines deliver on their promise? (2012)	Adam Mickiewicz University, Northwestern University, University of Maine	Poland, United States	—
6	Cytosystems dynamics in self-organization of tissue architecture (2013)	RIKEN Center for Development Biology	Japan	—

Independent citing papers only; self- and co-author citations excluded. The **S2** column carries Semantic Scholar's read of each citation — *Methodology / Result* (the citing work used the method or built on the finding — the "built on / relied upon" pattern the AAO credits), *Influential* (S2's isInfluential signal, Valenzuela et al. 2015), or *Background* (a passing mention).

D. Citing-Institution Prestige & Geography

Top citing institutions

Institution	Country	World ranking	Citing papers
Cornell University	United States	SCImago #61 · THE =18 · QS 16	6
Humboldt-Universität zu Berlin	Germany	SCImago #816 · QS 130	2
Universitat de Barcelona	Spain	SCImago #118 · QS 160	2
SUNY Health Science Center	United States	—	2
California Institute of Technology	United States	SCImago #449 · THE 7 · QS 10	2
Rutgers University	United States	—	2
Princeton University Press	United States	—	1
The Neurosciences Institute	United States	—	1
University of Pennsylvania	United States	SCImago #52 · THE 14 · QS 15	1
RIKEN Center for Development Biology	Japan	—	1
Centro Cardiologico Monzino, IRCCS	Italy	SCImago #3509	1
Sapienza Universitá di Roma	Italy	—	1
IFISC (CSIC-UIB). Instituto de Física Interdisciplinar y Sistemas Complejos	Spain	—	1
Tokyo Medical and Dental University (TMDU)	Japan	QS =697	1
TU Berlin	Germany	—	1

Geographic distribution of citing authors

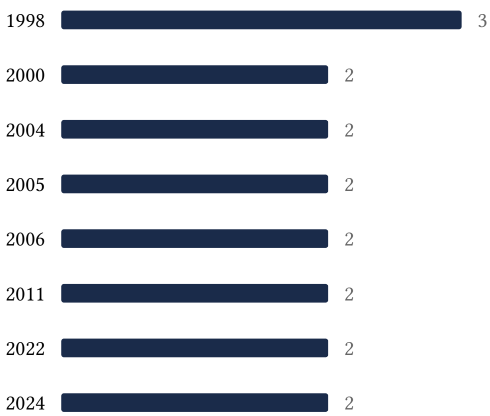
Country	Citing papers
United States	22
Spain	5
Germany	5
Italy	3
Netherlands	2
Belgium	2
Japan	2
United Kingdom	2

Country	Citing papers
Australia	1
Taiwan	1
China	1
Poland	1

Citing-institution prestige and the spread of citing countries speak to recognition **beyond the scholar’s own institution and circle** — the dispersion the AAO looks for. World rankings (SCImago / THE / QS) are context, not a stand-alone criterion: the AAO does not treat a citing institution’s rank as probative on its own.

E. Citation Growth Over Time

Distinct citing papers by publication year. Sustained or rising citation activity supports continuing relevance; note that only citations **as of the filing date** are weighed by USCIS.



F. AAO Precedent Considerations

Pre-filing self-check (AAO denial patterns)

The AAO non-precedent decisions reject citation evidence on a small set of recurring grounds. Confirm the petition addresses each before filing:

- [ ] Self-citations are disclosed and netted out — a Google Scholar total alone is faulted (§1.1).
- [ ] Evidence is per individual article, not a body-of-work aggregate total (§1.2).
- [ ] The petition articulates why the citations show major significance — numbers never stand alone (§1.5).
- [ ] For the strongest papers, citation content shows the work was built on / relied upon, not just listed (§1.6, §2.2).
- [ ] Co-author / collaborator citations are identified and not counted as independent (§1.7).
- [ ] Recognition is shown beyond the scholar's own institution and circle (§1.8).
- [ ] Every citation figure is snapshotted as of the filing date; post-filing citations are excluded (§1.9).
- [ ] Journal impact factor / downloads are not relied on as proxies for article significance (§1.10, §1.12).
- [ ] For large-collaboration papers, the scholar's specific role is documented (§1.13).

- ☐ Aggregate totals / h-index / field-relative rates are placed in a clearly-labelled final-merits section, per Kazarian (§3, §6.1.7).

Disclaimer

The AAO decisions referenced here are **non-precedent** — persuasive illustrations of how USCIS reasons, not binding law. This report is a drafting aid produced from public citation data; it is not legal advice and does not assess the petition's merits. All analysis must be reviewed by qualified immigration counsel.

G. Citation Evidence Index

Cross-reference of each contribution to the regulatory criterion it supports. Counsel should map these to the petition's exhibit numbers.

Contribution	Core paper	Indep. cites	Supports
Contribution 1	The geometry of biological time	9	8 CFR 204.5(h)(3)(v) — Criterion 5
Contribution 2	Biological rhythms and the behavior of populations of coupled oscillators	9	8 CFR 204.5(h)(3)(v) — Criterion 5
Contribution 3	Spiral waves of chemical activity	6	8 CFR 204.5(h)(3)(v) — Criterion 5