Finding Aid for the Frank B. Estabrook Papers

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Contributing Institution: California Institute of Technology. Caltech Archives
Title: Frank B. Estabrook Papers
creator: Estabrook, Frank B., 1922-
Identifier/Call Number: 10238-MS
Physical Description: 3.1 Linear feet(8 boxes)
Date (inclusive): 1966-2004
Abstract: Frank B. Estabrook is a Caltech alumus (M.S. 1947, PhD 1950). Estabrook was a physicist at JPL from 1960 to
2006, and Distinguished Visiting Scientist from 2006-2016. He is currently retired. Estabrook’s papers consist of project
outlines, meeting agendas and minutes, correspondence, and reports related to the Galileo spacecraft and gravitational
wave research.
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Preferred Citation
[Identification of item], Frank B. Estabrook Papers, 10238-MS, Caltech Archives, California Institute of Technology.
Immediate Source of Acquisition
Frank B. Estabrook donated his papers to the Caltech Archives in 2007.
Processing Information
This collection was processed in September 2016. All materials were originally in descending order, unfoldered. To assist
researchers accessing this collection, the processing archivist grouped like items to create series and subseries and
organized the papers in acid-free folders. The papers were arranged in chronological order.
Biographical / Historical
Frank Behle Estabrook (1922- ) began his academic career at Miami University in Ohio, and earned his BA in Physics and
Math in 1943. His interest in the study of gravitational waves began after learning Albert Einstein’s theory of relativity as a
Caltech graduate student. He earned both his M.S. and PhD in Physics and Math from Caltech in 1947 and 1950. After
completing his PhD, Estabrook returned to his alma mater, Miami University for two years as an assistant professor in
physics. In 1953 he returned to California and worked as a reactor physicist at Atomics International, a division of North
American Aviation. In 1956 he worked for the U.S. Army’s Office of Ordnance Research awarding research contracts.
Estabrook began his career at the Jet Propulsion Laboratory (JPL) in 1960, where he first worked half-time on relativity and
half-time on reactor physics. Estabrook returned to Caltech as a physics lecturer, and taught the course Physics 236,
As a JPL scientist, Estabrook’s areas of research consisted of spectroscopy, neutron transport physics, differential geometry,
general relativity and cosmology, and gravitational radiation. One of Estabrook’s notable joint projects was JPL/NASA’s
Galileo spacecraft gravitational waves search experiment (1989-2003) using x-band uplink frequency, but was unsuccessful
in detecting gravitational waves. Throughout his career he published more than 90 refereed papers in general relativity,
gravitational radiation, and differential geometry. He formally retired in 2006, but continued his work at JPL as
Distinguished Visiting Scientist until his official retirement in 2016, and is currently fully retired.
The Frank B. Estabrook Oral History with Shirley K. Cohen can be accessed in the Caltech Archives.
Scope and Contents
The Frank B. Estabrook Papers are housed in 8 archival boxes (1 half-sized and 7 standard archival boxes). The papers are
divided into three series, with one series divided into three subseries. The three series are: 1. Galileo and Gravitational
Waves Projects, 2. Correspondence, and 3. Reports and Proposals.
Series 1: Galileo and Gravitational Waves Projects has been divided into 3 subseries. Subseries 1: Project Outlines contains
outlines for Galileo planning efforts, ka-band and x-band radio science, and gravitational wave detection outlines, arranged
in chronological order. Subseries 2: Meetings contains meeting minutes and schedules, arranged in chronological order.
Subseries 3: Miscellaneous includes gravitational waves papers, NASA and JPL promotional material, and news clippings.

Series 2: Correspondence includes correspondence and interoffice memoranda to and from JPL, NASA, Caltech, or Joint Gravitational Wave Experiment group. Also includes letters from international letter writing campaigns.

Series 3: Reports and Proposals includes reports on Deep Space Network system requirements, the Jupiter Orbiter Probe, and also experiment proposals, mission requirements documents, and project plans.

Subjects and Indexing Terms
Astrophysics
Gravitational waves
Estabrook, Frank B.
Jet Propulsion Laboratory

Series 1: Galileo and Gravitational Waves Projects 1970-2004

Subseries 1: Project Outlines 1977-1997

box 1, folder 1  Project outlines re: gravitational wave detection, Galileo '85 mission 1977-1978, 1981
box 1, folder 2  Project outlines re: Galileo, X-band uplink, DPN Doppler, relativity 1982
box 1, folder 3  Project outlines re: Galileo, gravitational waves, spacecraft Doppler data 1987-1988
box 1, folder 4  Project outline for potential ASI collaboration on Cassini and SCM temperature regulation system 1989
box 1, folder 5  Project outlines and status re: Cassini, ka-band, x-band radio science, Galileo 1990
box 1, folder 6  GLL (Galileo) outline 1990-1991
box 1, folder 7  Project outlines re: Galileo goals and project status 1991 January-May
box 1, folder 8  Galileo Radio Science Team project packet 1992
box 1, folder 9  Project outlines re: gravity wave experiment, s-band 1992
box 1, folder 10 Project outlines re: joint Galileo/Mars Observer/Ulysses gravitational wave experiment, x-band 1993

Subseries 2: Meetings 1975-1992

box 2, folder 1  Meetings re: relativity, x-band, gravitational waves 1975, 1978
box 2, folder 2  Workshops 1978
box 2, folder 3  Meetings re: Galileo probe, x-band uplink 1979-1980, 1982
box 2, folder 4  NASA headquarters meeting 1988 February 29
box 2, folder 5  Meetings re: Galileo RST, starset availability 1990
box 2, folder 6  Meetings re: Galileo, gravity wave experiment 1991, 1992

Subseries 3: Miscellaneous 1970-2004

box 2, folder 7  Published papers and articles 1970-2004
   General
   Contains published papers by various authors, including Frank Estabrook, Hugo D. Wahlquist, and Kip Throne on spacecraft Doppler tracking, searches for millihertz gravitational waves, Pioneer II, Galileo, Ulysses, Mars Observer, Cassini, and LISA.
box 2, folder 8  Caltech News 1970
<table>
<thead>
<tr>
<th>Box and Folder</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>2, 10</td>
<td>Calculations, graphs, and notes 1978-1994, undated</td>
</tr>
<tr>
<td>2, 11</td>
<td>Galileo Radio Science Team roster and miscellaneous 1979-1994</td>
</tr>
<tr>
<td>2, 12</td>
<td>JPL news 1989, 1993</td>
</tr>
<tr>
<td>2, 13</td>
<td>Joint gravitational wave search press release 1993</td>
</tr>
<tr>
<td>2, 14</td>
<td>News clippings and magazine articles 1993, 1996</td>
</tr>
<tr>
<td></td>
<td>General</td>
</tr>
<tr>
<td></td>
<td>Primarily articles on Galileo and the search for gravity waves. Magazine articles include interviews and mentions of Frank Estabrook.</td>
</tr>
<tr>
<td>2, 15</td>
<td>Galileo investigator and project manager directory 1996 March</td>
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</tbody>
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**Series 2: Correspondence 1966-1997**

<table>
<thead>
<tr>
<th>Box and Folder</th>
<th>Description</th>
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<tbody>
<tr>
<td>3, 1</td>
<td>Correspondence 1966, 1969-1972</td>
</tr>
<tr>
<td>3, 2</td>
<td>Correspondence and memoranda 1974 February - 1975 November</td>
</tr>
<tr>
<td>3, 3</td>
<td>Correspondence and memoranda 1976 February-December</td>
</tr>
<tr>
<td>3, 4</td>
<td>Correspondence and memoranda 1977 January-December</td>
</tr>
<tr>
<td>3, 5</td>
<td>International letter writing campaign 1977, 1978 June-September</td>
</tr>
<tr>
<td></td>
<td>General</td>
</tr>
<tr>
<td></td>
<td>This campaign was to get the X-band onboard the Galileo mission.</td>
</tr>
<tr>
<td>3, 6</td>
<td>Correspondence and memoranda 1978 January- December</td>
</tr>
<tr>
<td>3, 7</td>
<td>X-band rejection notices 1978-1982</td>
</tr>
<tr>
<td>3, 8</td>
<td>Correspondence and memoranda 1979 January-November</td>
</tr>
<tr>
<td>3, 9</td>
<td>Correspondence and memoranda 1980 January-December</td>
</tr>
<tr>
<td>3, 10</td>
<td>Second international letter writing campaign 1980 August-September</td>
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<tr>
<td>3, 11</td>
<td>Correspondence and memoranda 1981 January-December</td>
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<tr>
<td>3, 12</td>
<td>Correspondence and memoranda 1982 January-April</td>
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<tr>
<td>3, 13</td>
<td>Correspondence and memoranda 1983 January-November</td>
</tr>
<tr>
<td>3, 14</td>
<td>Correspondence and memoranda 1984 January - 1986 November</td>
</tr>
<tr>
<td>3, 15</td>
<td>Correspondence and memoranda 1984 January - 1986 November</td>
</tr>
<tr>
<td>3, 16</td>
<td>Correspondence and memoranda 1987 February- December</td>
</tr>
<tr>
<td>3, 17</td>
<td>Correspondence and memoranda 1988 January - 1989 December</td>
</tr>
<tr>
<td>3, 18</td>
<td>Correspondence and memoranda 1990 February - December</td>
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<tr>
<td>3, 19</td>
<td>Correspondence and memoranda re: Galileo and x-band 1991 January-November</td>
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<tr>
<td>3, 20</td>
<td>Galileo status reports 1991 April-June</td>
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<tr>
<td>3, 21</td>
<td>Correspondence and memoranda re: ka-band radio science 1992 January-November</td>
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<tr>
<td>3, 22</td>
<td>Interoffice memoranda 1993 March-November</td>
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<tr>
<td>3, 23</td>
<td>Correspondence and memoranda 1994 February-November</td>
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<tr>
<td>3, 24</td>
<td>Correspondence and memoranda re: gravitational wave experiment 1995-1997</td>
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**Series 3: Reports and Proposals 1969-1995**

<table>
<thead>
<tr>
<th>Box and Folder</th>
<th>Description</th>
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<tbody>
<tr>
<td>6, 1</td>
<td>Proposal for a general relativity investigation radio science team Viking 1973, Mars mission 1969 October 10</td>
</tr>
<tr>
<td>6, 2</td>
<td>Issues in Gravitational Wave Detection with Space Missions 1973 June 18</td>
</tr>
<tr>
<td>6, 3</td>
<td>Cosmic microwave background radiation paper 1974 October 29</td>
</tr>
<tr>
<td>6, 4</td>
<td>Detection of Gravitational Radiation by Simultaneous Doppler Tracking of Several Spacecraft 1975, 1976</td>
</tr>
<tr>
<td>6, 5</td>
<td>Gravitational Waves from the Nuclei of Distant Galaxies draft by Kip Thorne 1975 June 1</td>
</tr>
<tr>
<td>6, 6</td>
<td>Cosmic Microwave Experiment Proposal: Part I 1976</td>
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<tr>
<td></td>
<td>General</td>
</tr>
<tr>
<td></td>
<td>The investigation and technical plan.</td>
</tr>
<tr>
<td>6, 7</td>
<td>Cosmic Wave Experiment Proposal: Part II 1976</td>
</tr>
<tr>
<td></td>
<td>General</td>
</tr>
<tr>
<td></td>
<td>Management and cost plan.</td>
</tr>
</tbody>
</table>
box 6, folder 8  
General  
Includes mission description document, science management plan, science rationale, and proposal.

box 6, folder 9  
**Miscellaneous proposals and plans 1976-1982**

box 6, folder 10  
**Deep Space Network (DSN), Spacecraft Tracking and Future Technology for Relativity Experiments presentation 1977 April 22-24**

box 6, folder 11  
**Proposed Radio Science Investigation for the Ecliptic Mission 1977 August 16**

box 6, folder 12  
**Gravitational Wave Detection with the Solar Probe 1978**

box 6, folder 13  
**Galileo project plan and policy 1978 May-August**

box 6, folder 14  
**Deep Space Network system requirements 1979 April 15**

box 6, folder 15  
**Planetary Data System Requirements: Multi-mission radio science requirements for the 1978 to 1988 era 1979 October 1**

box 7, folder 1  
**Proposed radio science investigation 1980**  
General  
For the International Solar Polar Mission.

box 7, folder 2  
**An Understanding of the Influences of Gravitational Experiments on a Solar Probe Mission 1980 March 31**

box 7, folder 3  
**X-band Uplink Technology Demonstration Experiment Requirements documents 1981 January 15**

box 7, folder 4  
**Draft report of the Starprobe ad hoc gravity and relativity committee 1981 March 3**

box 7, folder 5  
**Galileo Mission Requirements document 1981 December**

box 7, folder 6  
**Gravitational Waves Detection 1982 September, 1983 May-July**

box 7, folder 7  
**1986 Galileo Project: NASA support plan 1983 November 15**

box 7, folder 8  
**Project Galileo X-band Uplink Technology Demonstration Experiments document 1984 April**

box 7, folder 9  
**Report on the third station stability x-band measurements at DSS 13 1984 June**

box 7, folder 10  
**Mars Observer Telecommunications Subsystem 1985, undated**

box 7, folder 11  
**Multi-Mission Radio Science Requirements for the 1985 to 2000 era 1985 March 15**

box 7, folder 12  
**Deep Space Network preparation plan, Galileo Project 1985 April 15, May 1**

box 7, folder 13  
**Deep Space Network System functional design, x-band uplink 1986 May 1**

box 7, folder 14  
**Galileo Mission requirements documents 1987 March**

box 7, folder 15  
**Support instrumentation requirements document (SIRD) for the 1989 Galileo Project 1988 May**

box 7, folder 16  
**Problem/failure report 1989 September 18**

box 7, folder 17  
**Galileo Mission Director Status Report Post-Launch 1989 October-November**

box 7, folder 18  
**Cassini Ka-Band Precision Doppler and Enhanced Telecommunications System study 1990 January 22**

box 7, folder 19  
**Search for the Low-Frequency Gravitational Waves Using the Cassini RSS Facility 1990 February 8**

box 8, folder 1  
**Gravitational Wave Experiment 1990 July**

box 8, folder 2  
**Galileo Science Data Management Plan 1990 November 2**

box 8, folder 3  
**Ulysses Gravitational Wave Experiment Report on the First Opposition 1991 December**

box 8, folder 4  
**Ulysses: IO Plasma Torus Orientation Experiment and Gravitational Wave Experiment operations and data products report 1992 August 28**

box 8, folder 5  
**Gravitational Waves progress reports 1993, undated**

box 8, folder 6  
**Joint Gravitational Wave Experiment (jGWE) operations and data products report 1993 June 14**

box 8, folder 7  
**Gravitational Wave Experiment 95 1995 August 16**

box 8, folder 8  
**Astrodynamics, astrophysics, general relativity program first draft undated**

box 8, folder 9  
**Miscellaneous reports re: gravitational waves undated**