

# UW-TU:AOS Fall Workshop 2023 @UW, Seattle, USA

**Special Seminar on Sept 20 (W)**

**September 20 (W), 1:00pm in MoES #115, University of Washington**

## **Power generation from ammonia combustion: Challenges toward carbon neutral society**

Prof. Akihiro Hayakawa

Associate Professor, Institute of Fluid Science, Tohoku University, Japan

Sponsored by College of Engineering

A welcome remark by Prof. Jihui Yang, Vice Dean of the College of Engineering

The University of Washington and Tohoku University: Academic Open Space (UW-TU:AOS) presents a special seminar.

### **Power generation from ammonia combustion: Challenges toward carbon neutral society**

Akihiro Hayakawa  
Associate Professor  
Institute of Fluid Science, Tohoku University, Japan

September 20(W), 2023  
1:00pm @ MoES #115

Ammonia is a potential candidate of fuel towards carbon neutral society. Infrastructures for ammonia production, distribution and storage are available. However, there are challenges to use ammonia as fuel from the standpoint of combustion science for power generation by a gas turbine, since the characteristics of ammonia flame is remarkably different from those of conventional hydrocarbons, such as methane.

In this talk, a background of ammonia utilization will be introduced. Fundamental flame characteristics of ammonia, such as laminar burning velocity and product gas characteristics, are explained. Then, a new combustion concept is shown to achieve simultaneous reductions of NO and unburnt ammonia from ammonia flame.

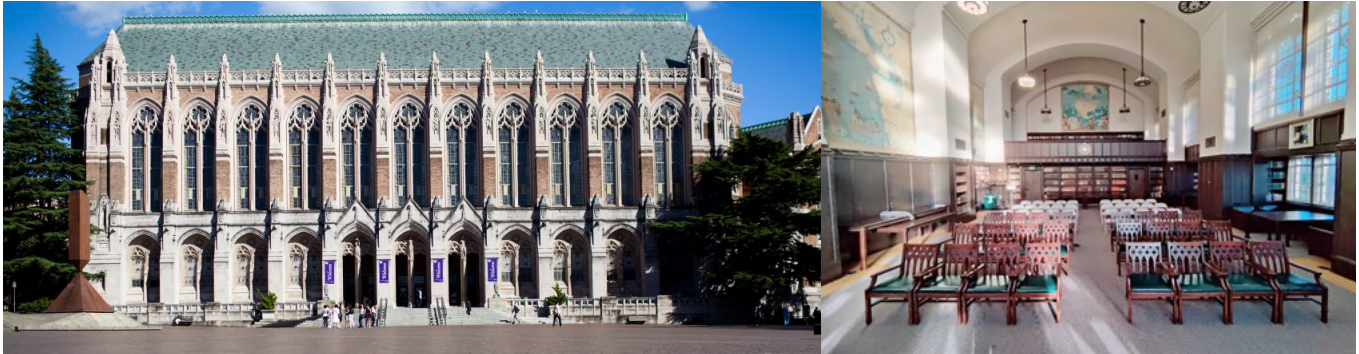
Profile of Dr. Akihiro Hayakawa:  
Received PhD from Kyushu University in 2013, Dr. Akihiro Hayakawa has been engaged in research of application of NH<sub>3</sub> as a near zero emission fuel system. Currently, he serves as an associate professor at the Institute of Fluid Science, Tohoku University. His research interests are ammonia combustion, high pressure combustion, turbulent combustion, and laser diagnostics. Dr. Hayakawa was a visiting researcher at University of Cambridge in 2015. He was selected to 2022 Energy and Fuels Rising Stars from ACS (American Chemical Society) Publications.



This seminar is sponsored by UW-College of Engineering.

**September 21(Th), 2023**  
**AOS Workshop: Session-A**

@Smith Room in Suzzallo Library, UW



Smith Room is located on the second floor in the Suzzallo Library (UW Pressbooks Photo)

<https://www.lib.washington.edu/suzzallo/>

## **Digital Engineering and New Energy Ecosystem in Aeronautics**

Modern aviation industries are rapidly transforming into Digital Engineering, and are fostering development of New Energy sources for next generation Ecosystem. The UW-TU:AOS organizes this workshop to further strengthen the bridge between academia and industry in this regard. The workshop features recent advancement in simulation-based and/or data-driven technologies for aeronautical engineering from academic and industrial frontrunners. The topics cover a wide range of simulation-based engineering, including multi-physics simulations, design optimization, data-driven technologies. The workshop also expects academia and industrial practitioners as well as government agencies to highlight their recent views toward the new energy ecosystem. Adoption of various new energy sources to aviation industries is discussed. This workshop particularly aims for young scientists and engineers from both Japan and the United States to participate and establish connections for future collaborations.

- 9:00 Opening and Introduction  
Fumio Ohuchi, Professor Emeritus of the University of Washington, and Specially Assigned Professor for the Tohoku University
- 9:05 Welcome remarks  
Wolfram Latsch, Associate Vice Provost of Global Affairs, University of Washington
- 9:10 Briefing, New Age of UW-College of Engineering  
Jihui Yang, Vice Dean of College of Engineering, University of Washington
- 9:15 Welcome remarks from Industry  
Tia Benson Tolle, Director, Technology and Sustainability BCA Product Development

- 9:20 Keynote speech 1 “Digital Engineering in Aeronautics: University Response”  
Steven Brunton, James B. Morrison Endowed Career Development Professor of  
Mechanical Engineering University of Washington

Accurate and efficient nonlinear dynamical systems models are essential to understand, predict, estimate, and control complex aerospace systems. In this talk, I will explore how machine learning may be used to develop these models purely from measurement data. We explore the sparse identification of nonlinear dynamics (SINDy) algorithm, which identifies a minimal dynamical system model that balances model complexity with accuracy, avoiding overfitting. This approach tends to promote models that are interpretable and generalizable, capturing the essential “physics” of the system. We also discuss the importance of learning effective coordinate systems in which the dynamics may be expected to be sparse. This sparse modeling approach will be demonstrated on a range of challenging modeling problems, for example in fluid dynamics. Because fluid dynamics is central to transportation, health, and defense systems, we will emphasize the importance of machine learning solutions that are interpretable, explainable, generalizable, and that respect known physics.

- 9:40 Keynote speech 2 “Digital Engineering in Aeronautics: Industry Response”  
Dennis Eng, Vice President, Information Technology & Data Analytics, BCA Chief  
Information Officer & Digital Transformation Program Manager

The aviation industry is looking towards the digital, augmented intelligence and machine learning capabilities to help it meet its goals. Boeing has been leveraging these technologies in today’s design and production, and looking for increased use as technical capabilities mature. In design, the Boeing 777X leveraged early digital tools in its innovative design. And The T-7A, an advanced trainer for the U.S. Air Force, uses model-based engineering and 3D design tools to realize an 80% reduction in assembly hours. In production, connectivity through Internet of Things, or simply IIoT connects physical things — such as production tools and manufacturing equipment — with various control systems. These systems process and calculate large amounts of data and feed the information back into the production system, providing actionable intelligence in near real time. This talk will share some of the recent ways Boeing leverages digital tools and share challenges and opportunities for the academic community to help accelerate tools for the future.

- 10:00 High-fidelity flow simulation technologies toward data-driven fluid-structure  
interaction analysis and aircraft design, Yoshiaki Abe, Assistant Professor,  
Institute of Fluid Science, Tohoku University

For the development of next-generation aircraft, high-fidelity flow simulation and fluid-structure interaction analysis are essential technologies. This presentation covers three simulation-related topics pertinent to aircraft design. High-order schemes for compressible flows in a deformed domain are the initial topic. The so-called symmetric conservative metrics that satisfy the geometric identities and the strong conservation property are presented. The second topic is our multi-scale framework for composite aircraft design, which includes the aerostructural design of aircraft with carbon-fiber-reinforced plastics (CFRP) and thermoplastic CFRP. The third topic is preliminary research using data-driven methodologies on static and dynamic aeroelastic analysis.

- 10:15 Education of AI/ML in engineering in UW  
Luna Huang, Associate Teaching Professor, Materials Sci. & Eng., University of  
Washington

Integration of AI and data science into our everyday lives has become both intentional and inadvertent; however, AI and data science are still in the process of penetrating sectors such as manufacturing and research, in which domains they function as novel tools, navigating the intricate journey towards achieving widespread application. As educators, we enthusiastically embrace this technological transformation and are

resolute in our commitment to nurturing students into adept professionals. Collaborating closely with local industries and the UW data science community, we have curated a series of data science courses for our students. While our pedagogical approach diverges from conventional focus on coding and algorithmic intricacies, we orchestrate our classes to facilitate hands-on experiences, guiding students in the practical application of data science within the context of materials science and engineering. A primary emphasis is placed on equipping students with the ability to decipher and interpret outcomes generated from such applications. Furthermore, our collaborative partnerships with local industries yield invaluable opportunities for students to engage with real-world data challenges through hackathons and internships.

**10:30 Keynote speech 3 “Qualification & Certification by Analysis (QCbA) and Digital Engineering(DE)”, John J. Dong, Ph.D., Senior Technical Fellow, The Boeing Company**

Digital engineering (DE) has become the critical important for current and future aerospace product development. DE has changed the way we design and build a product. Boeing is the industry leader in digital engineering. One of ultimate goals for DE is to carry out as much as possible simulation analysis in the virtual world to validate and verify the product design before we build the physical product. Product qualification and certification by analysis is the critical part of DE.

Product qualification and certification by analysis require to build high fidelity simulation models and to quantify uncertainties associate with those simulation models. In last several decades, Boeing has invested significantly in developing various methods and processes, such as Boeing digital diamond, building block approach, smart testing approach, and 3D massive model visualization and analysis, to drive DE and product qualification and certification by analysis. In the speech, we will briefly discuss those methods and processes, and demonstrate how QCbA and DE are used to support Boeing various product development, production and certification.

**10:50 Toward CbA and DE in Aircraft Design: University Response  
Shigeru Obayashi, Professor of Tohoku University**

With support from the New Energy and Industrial Technology Development Organization (NEDO), a Japanese research funding agency, Tohoku University has been working with a major Japanese company to develop software to support aircraft design by performing integrated simulations from atoms and molecules of aircraft materials to aircraft structure. We believe that these efforts will be useful in realizing the Digital Twin of aircraft as part of Digital Engineering. In addition, we believe that CbA is very important to make use of the results in the future, because design and certification are tightly coupled.

**11:00 Lunch break**

**12:00 Keynote speech 4 “New Energy & Sustainability Ecosystem in Aeronautics”  
Christin Datz, Technical Fellow, Boeing Company**

Aerospace is more than an industry; it is integral to modern life. We globally connect people, protect through national security and humanitarian relief, explore our shared world and beyond, attract young minds to STEM and contribute greatly to global commerce. The commercial aviation industry also generates about 2.5% of the world’s carbon emissions. We have a new shared industry challenge ... decarbonization. We can reach commercial aviation’s net zero commitment by 2050, together. Boeing focuses on four strategies to decarbonize aviation: fleet renewal, operational efficiency, renewable energy, and advanced technology. And we need them all. Boeing has developed the Cascade Climate Impact Model, a digital modelling tool, to explore these decarbonization strategies and the impact they can have on emissions. Cascade and other data sources show that Sustainable Aviation Fuels is the biggest lever commercial aviation has to reduce emissions over the next 30 years. Boeing has been a pioneer in making SAF a reality working with airlines, engine manufacturers and others to create feedstock pathways, scale infrastructure, and ensure Boeing airplanes can fly on 100% SAF. Boeing continues to work on entire ecosystem for a more sustainable aerospace future, testing new technologies for existing airplanes, and collaborating on flight demonstrators and future flight concepts.

12:20 University Response to “New Energy Ecosystems” from Tohoku University  
Takashi Tokumasu, Professor of Institute of Fluid Science, Tohoku University

Currently, fuel cells are attracting attention as a power source for electric aircraft. In order to increase the efficiency of fuel cells, it is necessary to optimize the transport characteristics of reactants and products inside fuel cells. In this study, we will introduce examples of analyzing the mass transport characteristics inside a polymer electrolyte fuel cell, which is currently in commercial use, by large-scale molecular simulations such as Density Functional Theory (DFT), Molecular Dynamics (MD) and Coarse Grained Molecular Dynamics (CGMD) simulations.

12:40 Pitch-Talks from Japan’s heavy industries

Mitsubishi Heavy Industries Aero Engines, Yohei Fujimoto, Kanechika Nakanishi,  
Recent activities on Mitsubishi Heavy Industries Aero Engines

IHI Corporation, Yoshinori Oba, IHI’s R&D activities on the diversification of energy  
sources for sustainable new generation aircraft

(Attendees also from Kawasaki Heavy Industries(KHI) and Toray Composite Materials  
America)

12:50 UW’s up-date of new activities (6 min max. pitch-talk)

Xu Chen, Associate Professor, New Direction of BARC

Marco Salviato, Associate Professor UW’s new composite center

Navid Zobeiry, Assistant Professor, UW’s new initiatives on DE

Owen Williams, Research Assistant Professor, Non-uniform fluid properties on turbulence

13:25 Tohoku’s up-date of new activities (6 min max. pitch-talk)

Jun Ishimoto, Professor; Supercomputing multiphase flow phenomena by utilizing DX  
and its application to transport vehicle elements production technology

Hisashi Nakamura, Associate Professor; Toward zero combustion emissions and zero  
battery fire accidents

Hidemasa Takana, Professor; Innovative in situ Synthesis of Conductive Polymer  
(PEDOT) by Discharge Inside a Bubble

Atsuki Komiya, Professor; Visualization of Rapid and Tiny Heat and Mass Transport  
Phenomena Using High-speed Phase-shifting Interferometer

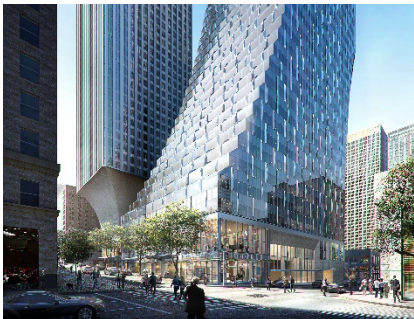
Aiko Yakeno, Assistant Professor (co-authored with Yuji Mori, Shigeru Obayashi);  
Trials for flow friction-drag reduction of high-speed vehicles

- 1:55 Wrap up
- 14:00 Move to Consulate General of Japan Guest House in Queen Anne
- 15:00 Joint reception at the Consulate General of Japan Guest House  
(23 Highland Dr., Seattle, WA)  
Details shown on Page 8 (Light Blue highlighted portion)

**September 21(Th), 2023**  
**AOS Workshop: Session-B**

**Japan Seattle AI Innovation Meetup 21.0**

**09:30 All of Japan Delegation Companies to Meet at:**



**Suite 325, Rainier Square 3<sup>rd</sup> Floor,  
401 Union Street, Seattle, WA**

- \*Venue and meal are sponsored by Orrick.
- \*Japanese style cards exchange time before the sessions.
- \*Morning Coffee/Tea/Water, and Lunch will be served.

**10:00 Briefings by WSDoC and Co-Organizers for WA State Innovation Ecosystem**

- 10:00 Opening and Introduction of Japan Delegation  
Tetsuro Eto, Japan Representative, WA State Dept. of Commerce
- 10:10 Greetings  
Yotetsu Hayashi, Chief Executive Director, JETRO San Francisco  
Isabelle De Wulf, Managing Director, WA State Dept. of Commerce
- 10:20 Doing Business in Washington State  
Radi Simeonova, Managing Director, WA State Dept. of Commerce
- 10:30 Keynote Session 1 (Quantum Computing)  
**Quantum Information Sciences (QIS) in Washington State**  
Nirav Desai, CEO, Moonbeam Exchange  
[www.moonbeam.ai/exchange](http://www.moonbeam.ai/exchange)

11:00 Keynote Session 2 (Blockchain)  
Nathan McDonald, CEO, Keiretsu Capital, and Chairman, Keiretsu Forum NW  
<https://www.linkedin.com/in/nathanmcdonald1/>

11:30 Session Ends

Lunch will be served at the venue.

12:30 Move to Official Residence of Japanese Consul General  
(On your own by Uber/Lift)

**13:30 Reverse Pitch by Japan Delegation and Networking Reception  
at Official Residence of Japanese Consul General: 23 Highland Dr., Seattle, WA**



(Street View by Google)

### **Part 1 : Reverse Pitch Sessions by Japan Delegation**

13:00 Delegation, Innovators, and other guests' arrival

13:30 Announcement from Japanese Consulate

13:32 Opening Remarks by Tetsuro Eto, WSDoC-J

13:35 Welcome by Isabelle De Wulf, WSDoC

13:37 "2024 WA State Cleantech Mission to Japan" announced by Tammy Deets, WSDoC

13:40 Greetings by Blake Ilstrup, Orrick

13:45 Greetings by James Reed Jr., SWAN

13:50 Keynote: Yotetsu Hayashi, JETRO

13:55 Guest Keynote: Masashi Morimoto, NEDO

13:58 Japan Delegation Introduction by Tetsuro Eto

## Reverse Pitch Talks

14:00 Pitch 1	Chubu Electric Power	<a href="https://www.chuden.co.jp/english/">https://www.chuden.co.jp/english/</a>
14:05 Pitch 2	Kobe Trade Information Office	<a href="https://cityofkobe.org/ktio/">https://cityofkobe.org/ktio/</a>
14:10 Pitch 3	Hitachi Digital	<a href="https://www.hitachi.com/">https://www.hitachi.com/</a>
14:15 Pitch 4	NTT Communications	<a href="https://www.ntt.com/en/index.html">https://www.ntt.com/en/index.html</a>
14:20 Pitch 5	SBI Investment	<a href="https://www.sbinvestment.co.jp/en/">https://www.sbinvestment.co.jp/en/</a>
14:25 Pitch 6	Shin Nippon Biomedical Laboratories	<a href="https://www.snbljapan.com/">https://www.snbljapan.com/</a>
14:30 Pitch 7	Gemseki	<a href="https://www.gemseki.com/en/">https://www.gemseki.com/en/</a>
14:35 Pitch 8	TOYOTA TSUSHO	<a href="https://www.toyota-tsusho.com/english/">https://www.toyota-tsusho.com/english/</a>
14:40 Pitch 9	Blue Practice (Tohoku Univ. Spin Out)	<a href="http://eng.bluepractice.co.jp/">http://eng.bluepractice.co.jp/</a>
14:45 Pitch 10	CERKIT (Tohoku Univ. Spin Out)	<a href="https://cercit.co.jp/">https://cercit.co.jp/</a>

14:50 End of Reverse Pitch Session

14:55 Announcement for Part 2 by Consulate to move to Group to the garden for group photo shooting.

## Part 2 : Networking Reception

@ Consulate General of Japan, Guest House, Queen Anne, 23 Highland Dr. Seattle

14:45 AOS guests' arrival from UW

15:00 MC Announcement for group photo shooting

15:10 Welcome Speech by the Hisao Inagaki, Consul General of Japan

15:15 Foreword by Chris Green, Assistant Director, Washington State Dept of Commerce

15:20 Successful Showcase: TBA

15:25 Toast by Dr. Fumio Ohuchi, UW Professor Emeritus & Specially Assigned Prof. for TU

15:30 Networking Reception Starts

17:00 End of Reception Announcement

### Please note the following:

1. There are no Parking space available and Alcoholic drinks will be served so please use ride share or taxi.
2. This event invitation only and pre-registration is required.



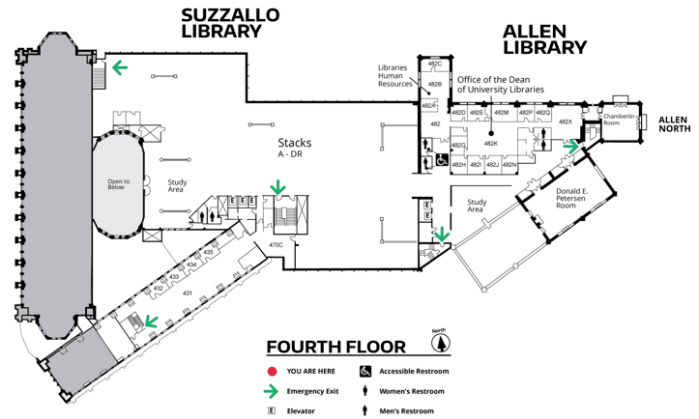
3. This is the Official Residence of Consul General of Japan so there will be Security.
4. **No WiFi** at the Residence.
5. Photo policy (no photos showing doors or windows inside the residence – outside only the bottom of the residence is okay)
6. You are required to obtain permission from Media Relations Officer if you want to share content of the CGJ Residence event on Social Media such as Facebook, Twitter etc. Please ask CGJ Staff member.

At the reception party, drink and light meals will be served.

# September 22 (F), 2023

## AOS-Entrepreneurial Workshop

@ Donald E. Petersen Room, UW Suzzallo and Allen Libraries 4F, 4000 15th Ave NE, Seattle, WA



- 9:00 Opening and AOS Overview  
Fumio Ohuchi, UW Professor Emeritus and Specially Assigned Professor for Tohoku University
- 9:05 Introduction of Japan Delegation  
Tester Eto, Japan Representative, WA State Dept. of Commerce
- 9:15 Welcome remark and introduction of UW-CoMotion  
François Baneyx, Director, CoMotion, and Vice Provost for Innovation, UW.
- 9:35 Entrepreneurial education and business in Tohoku University  
Masahiro Yamaguchi, Vice-President of Global Affairs, Tohoku University  
and  
Masahiko Hayasaka, Deputy General Manager of Startup Incubation Center
- 10:00 Research Center for Green X-Tech  
Tomonaga Okabe, Director of the Green X-Tech
- 10:15 Break
- 10:30 Tohoku Entrepreneurial initiatives (10 min each x4 plus discussion)

Prof. Miwako Kitamura: [Plan to develop a handheld device that can understand and enrich the lives of individuals, including caregivers, those facing emotional challenges, and diverse minorities. This portable AI device responds to their needs, promoting well-being and enhancing daily life, even in disasters. Through this workshop, we are interested in connecting venture companies well-versed in GIS, AI communication, and soft robot technology.](#)

**Prof. Makoto Ohta:** Exhaled omics analysis equipment can detect virus such as covid-19 in the room quantitatively to predict the pandemic or epidemic of Exhaled Disease. This equipment was developed originally a direct analyzer of Exhaled Disease established by prof Takaaki Akaike for analysis of metabolic disease via exhalation. Aerosols in a room is condensed and frozen, so that the virus could be detected directly without any destroy. We already ran this equipment in different congress and found covid-19 virus. We hope collaborate together under putting this equipment in public places.

**Dr. Yokokawa:** CERCIT Co., Ltd. is a venture company established by the Clinical Skills Lab, a medical educational institution at Tohoku University. We have been involved in development and sales of several educational products for medical professionals. Through this workshop, we would like to work with CoMotion for developing sales channels of our echo-guided puncture models in North America. We also would like to get knowing companies that are interested in expanding to Japan in the medical field.

**Prof. Koshimura:** is a Co-Founder and CTO of RTi-cast, university-based technology start-up to offer real-time tsunami inundation damage forecast services to government organizations and commercial clients. He would like to make a further connection with CoMotion based companies and/or individuals who might be interested in developing tsunami related products.

**11:15 Site Tour for All (Will split Japan Delegation and TU/AOS)**

Leave for a site tour to Fluke Hall (Life Science and Hardware Incubator) by walk.  
4000 Mason Rd, Seattle, WA  
(split the group into two groups to conduct the tour)

12:30 End of the tour

12:30 Lunch at Husky Union Bldg. on your own.  
<https://hub.washington.edu/eat/>  
4001 E Stevens Way NE, Seattle, WA

**Pitch and Networking at Donald E. Petersen Room**

13:30 CoMotion Startups Pitch Talks

PulseDNA	<a href="https://www.pulseshow.ai">https://www.pulseshow.ai</a>
SharpArrow	<a href="https://sharparrowmedical.com/">https://sharparrowmedical.com/</a>
WeWave AI	<a href="http://www.wewave.app">www.wewave.app</a>
AIVS Inc	<a href="http://www.aivs.us">www.aivs.us</a>
Proteios Technology, Inc.	<a href="https://www.proteios.com/">https://www.proteios.com/</a>
Ora Biomedical, Inc.	<a href="https://orabiomedical.com/">https://orabiomedical.com/</a>
Baw Bab Technologies, Inc.	<a href="https://bawbab.us/">https://bawbab.us/</a>
Foxtrot Health	<a href="https://www.foxtrot.health/">https://www.foxtrot.health/</a>

CWTCH (Means - Safe space in Welsh)

[www.cwtch.tech](http://www.cwtch.tech)

Vitalink AI

<https://vitalink.ai>

New Frontier Aerospace

<https://www.nfaero.com/>

Nomi

[www.nomi.care](http://www.nomi.care)

15:00 Networking

16:30 Ends