LEVEL 3:
BE ATTRACTIVE.

THESE ARE FUTURE CONTACTS.

(FUTURE EMPLOYERS?)

LEVEL 3:
BE ATTRACTIVE.

Quite simply, they
want to be “wowed.”

THESE ARE
FUTURE CONTACTS.

(FUTURE EMPLOYERS?)

LEVEL 3:
BE ATTRACTIVE.

LEVEL 3:
BE ATTRACTIVE.

1. LET IT BREATHE!

2. CUSTOMIZE COLORS/FONTS

3. GO BIG OR GO HOME.

LEVEL 3:
BE ATTRACTIVE.

1. LET IT BREATHE!

Investigating mesospheric gravity wave dynamics over McMurdo Station, Antarctica (77° S)

Jonathan R. Pugmire, Mike J. Taylor, Yucheng Zhao, P.-Dominique Pautet
Center for Atmospheric and Space Sciences, Utah State University

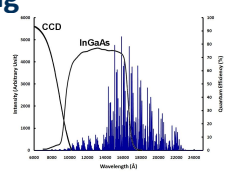
Introduction

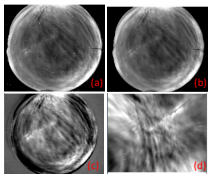
The Antarctic Gravity Wave Instrument Network (ANGWIN) is an NSF sponsored international program designed to develop and utilize a network of gravity wave observatories using existing and new instrumentation operated at several established research stations around the continent. Utah State University's Atmospheric Imaging Lab operates all-sky infrared imagers at several research stations. Here we present novel measurements of short-period and larger-scale mesospheric gravity waves imaged during 2012 from McMurdo Station (77.8°S, 166.7°E) on Ross Island. This IR camera has operated at Arrival Heights alongside the University of Colorado Fe Lidar during the past three winter seasons (March-September 2012-2014). Two initial primary goals are:

- Quantify the properties of small- and medium-scale mesospheric gravity wave climatology over this region of Antarctica.
- Combine results with similar measurements from other ANGWIN stations to investigate continental-wide gravity wave dynamics (see SA31B-4100).

IR Imaging

All-sky observations of the OH emission layer (~87 km) were made using an infrared (0.9-1.7 μm) cooled InGaAs camera. The OH airglow emissions are much stronger in the infrared region (>1 μm), as shown in blue in the figure to the right, and we use new InGaAs cameras to obtain high-quality short-exposure images of gravity waves under auroral and full moon observing conditions.





Example image processing from June 25, 2012, 09:57 UT.

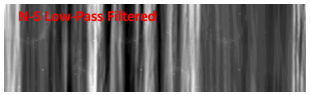
Raw all-sky (180°) OH image data were recorded every 10 s with a 3 s exposure enabling detailed measurements of individual gravity wave events.
(a) Raw image oriented using the IR star field.
(b) Stars removed
(c) Flat fielded: Average nightly image subtracted.
(d) Unwarped to 350 x 280 km geographic grid at 87 km altitude.

Optical site at Arrival Heights, McMurdo Station

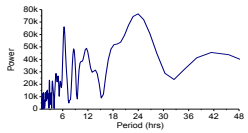
Gravity waves were analyzed using well-developed Fourier analysis techniques to determine direction of propagation (θ), horizontal wavelength (λ), observed horizontal phase speed (*v*) and wave period (T) [e.g. Taylor, et al, 1997].

During the 2012 observing period (March-September, nighttime hours) at McMurdo over 400 short-period (<1 hr) gravity wave events were observed.

Large-Scale Tidal Analysis

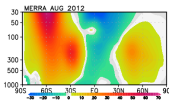


A **low-pass filter (>1 hr periods)** of the large 73 hour keogram revealing strong tidal features with characteristic periods as identified in the FFT analysis.

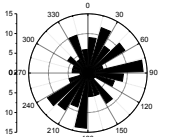


FFT power spectrum analysis identifying mesospheric tidal signatures. Note the strong diurnal tide at 24 hours and several harmonics at 6, 8, and 12 hrs.

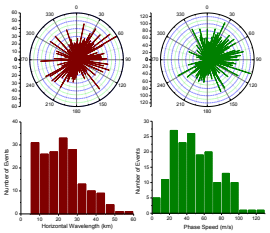
Two Awesome Weeks in August



Zonal Mean Wind: Eastward winds throughout the stratosphere (77°S) create a critical layer for eastward wave phase speeds less than ~30 m/s [MERRA].

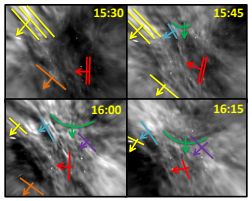


Wave headings for 180 events on UT days 214-230.



On August 2-18, 2012 (UT day 214-230) over 180 small-scale gravity wave events were observed. Their characteristics were similar to the full season results except their average phase speeds (50 m/s) were significantly higher. These wave events dominated the end of season results. The phase speed distribution is consistent with critical level wind-filtering [Nielson, et al, 2012] with much higher eastward phase speeds.

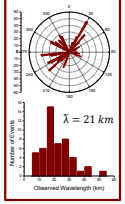
Three Continuous Days in June



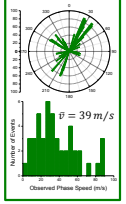
The four unwarped images above show example 350 x 280 km airglow images taken on day 176 every 15 minutes revealing both the high level of wave activity and quality of the images. Several wave features are highlighted as they propagate through the images. The blue and green lines can also be seen in keogram data below, wave event #1.

In mid-winter there is continuous darkness at McMurdo. From June 23-26, 2012 (day 175-178) over 40 small-scale gravity wave events were analyzed during 73 continuous hours of observations. Their properties are shown in the figures below.

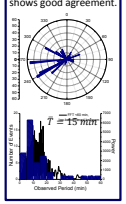
Observed Wavelength
Note the prevailing NE and SW wave motions, similar to the winter summary plot.



Observed Phase Speed
Note the large spread and preferential direction of waves with higher phase speeds.



Observed Period
The black line is a power spectrum of the keogram using a high-pass (<60 min) filter and shows good agreement.



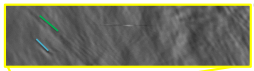
Keograms

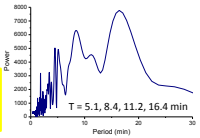
Both large- and small-scale gravity wave features can be studied by creating keograms. A keogram is made by stacking vertical (and horizontal) slices through the center of each image together to form a time series revealing wave activity as a function of time. The large keograms along the bottom of the poster shows 73 continuous hours of wave data starting (day 175, 01:33 UT to day 178, 03:09 UT). These data illustrate the high quality of our gravity wave measurements from Antarctica.

Small-Scale Gravity Waves

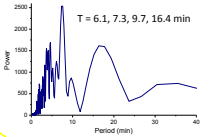
A **high-pass filter** was applied to the keogram to measure small-scale gravity waves with periods of 5-60 min (as highlighted in yellow boxes). Two selected wave events are shown together with their FFT power spectrum. These are compared with the event properties analyzed from the individual airglow images.

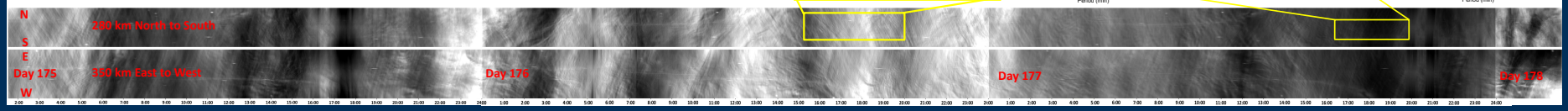
Wave Event #1: Day 176, 15:30-19:00
λ = 22 ± 3 km θ = 217° ± 5°
v = 44 ± 5 m/s T = 8 ± 3 min



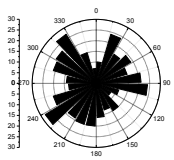


Wave Event #2: Day 177, 16:50-20:00
λ = 24 ± 3 km θ = 318° ± 5°
v = 42 ± 5 m/s T = 10 ± 3 min



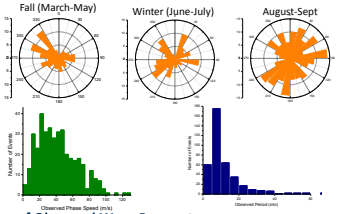


Summary: 2012 Wave Parameters



Distribution of Wave Headings: Winter season wave motions were prominent in several directions.

The data show evolution from NW propagation (107 events) in the fall which expands to NE and SW wave motions during mid-winter (110 events). The late winter was dominated by many waves (202 events) again exhibiting strong NE and SW motions but more isotropic than earlier. The strong asymmetries are suggestive of localized sources.



Distributions of Observed Wave Parameters

A total of 419 events were analyzed. Their average values were λ= 22 km, *v* = 42 m/s, T = 12 min. These mean values and their ranges are typical for short-period gravity waves observed at several sites around Antarctica as part of ANGWIN.

Summary

We have analyzed one year of data to date from McMurdo Station, Antarctica. The results are as follows:

- A large number (400+) of short-period gravity waves observed over McMurdo, Antarctica enabling the wintertime mesosphere wave climatology to be investigated for the first time.
- McMurdo waves exhibits a large spread of phase speeds with a tendency for high phase speeds up to ~120 m/s.
- New keogram analysis enables the investigation of larger period gravity waves and tidal perturbations in the mesosphere revealing 6, 8, 12, and 24 hr tides and harmonics.
- The sources of the wave events observed from McMurdo are probably associated with strong localized weather systems associated with the polar vortex.
- Small-scale wave event analysis results are comparable using FFT and keograms.

Sketch illustrating direction of propagation from McMurdo

Future Work

- Ongoing measurements from the South Pole station in combination with other ANGWIN sites will be used to investigate pan-Antarctic anisotropy and wave parameters.
- New analysis of McMurdo data from 2013 and 2014 data will further clarify the asymmetries in the wave propagation at this site for understanding the climatology of gravity waves observed at McMurdo.
- Comparison with onsite Fe Boltzmann Lidar measurements and MF radar wind measurements.

References

MERRA Atlas, GEOS-5, August 2012, NASA Goddard Space Flight Center, Retrieved December 11, 2014.

Nielsen, K., Taylor, M. J., Hibbins, R. E., Jarvis, M. J., & Russell, J. M. (2012). On the nature of short-period mesospheric gravity wave propagation over Halley, Antarctica. *Journal of Geophysical Research: Atmospheres (1984–2012)*,*117*(D5).

Taylor, M.J., W.R. Pendleton, Jr, S. Clark, H. Takahashi, D. Gobbi, and R.A. Goldberg (1997). Image measurements of short-period gravity waves at equatorial latitudes, *J. Geophys. Res., 102*, 26,283-26,299.

Acknowledgements This research was supported by NSF grant ANT-1045356.

Design of Miniaturized Time-of-Flight Reflectron Mass Spectrometer for Upper Atmosphere Density Measurements

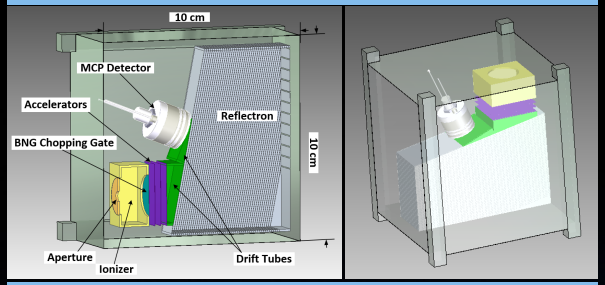
Michelle Lynn Pyle[1,2], Dr. Ryan Davidson[1], Dr. Erik Syrstad[2], Dr. Charles Swenson[1]

[1]Utah State University Department of Electrical and Computer Engineering, [2]Space Dynamics Laboratory

SA43A-4083

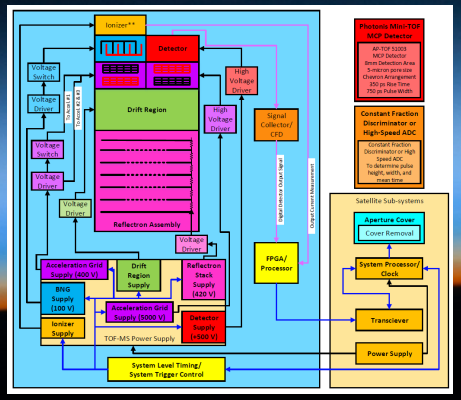
Time-of-Flight Mass Spectrometry (TOFMS) is a technique for determining particle mass using a temporal data spectrum. Charged particles are accelerated through an electric potential, with higher resulting particle speeds corresponding to particles with lower mass. A particle's time of arrival is measured and used to determine the particle mass.

Mission: Data from density and composition studies of Earth's upper atmosphere are used to improve atmospheric models. The Miniaturized Time-of-Flight Mass Spectrometer will be designed for a CubeSat bus and will be capable of providing data with better temporal and spatial resolution than previous instruments flown on larger satellites. This design aims to leverage full-scale TOF resolution techniques to achieve mass resolution comparable to larger instruments.



Entrance: Aperture, Ionizer, and Bradbury-Nielsen Gate (BNG) (signal modulation)
Accelerators: Charged grids to create acceleration fields
Drift Tubes: Field-free regions, particles separate by mass.
Gradient Reflectron: Parabolic field to reflect particles
Detector: Miniaturized Micro-channel Plate (MCP) detector

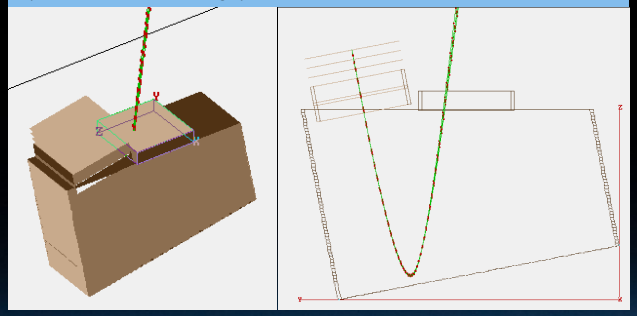
Electronics plan for the TOF-MS: High voltage drivers for the reflectron, detector, and accelerators; High-speed switching drivers for the BNG; High-speed pulse detection for the MCP signal.



Search for Optimal Dimensions: Optimization functions written in MATLAB calculated maximum drift region lengths given a set of dimensions [reflectron depth, spacing between accelerators, accelerator voltages], calculated flight times for 60 AMU, and evaluated each dimension set based on a spacing parameter.

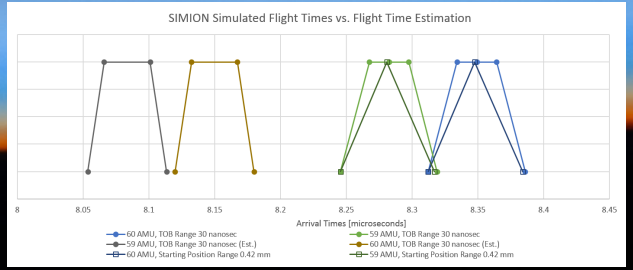
$$spacing = \frac{width\ of\ 60\ AMU\ peak\ [seconds]}{distance\ between\ 59\ and\ 60\ AMU\ peaks\ [seconds]}$$

Outcomes of the dimension search suggested larger dimensions for the reflectron depth [55 mm reflectron design pictured].

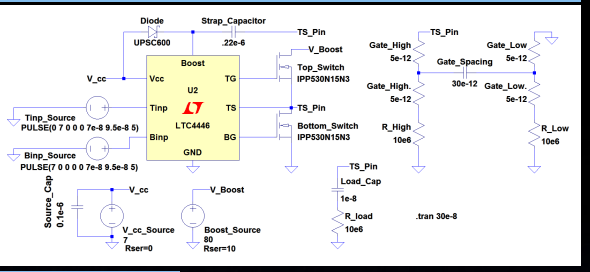


SIMION was used to evaluate reflectron electrode potential sets and electrode shapes.

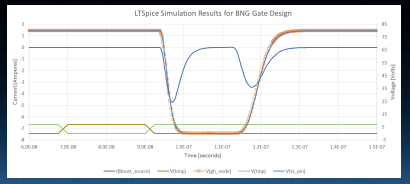
Flight time estimations and SIMION simulation results show similar resolving power. Flight time estimation was run using a 30 nanosecond Time of Birth (TOB) range. SIMION simulations were run for a 30 nanosecond TOB range and a 0.42 mm starting position range (based on a 50 nanosecond gate pulse and thermal velocity distribution of the particles).



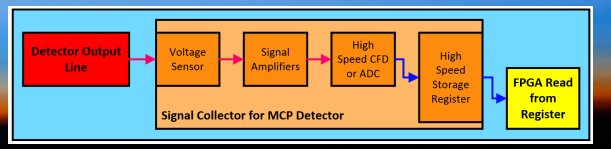
BNG Driver Design: Alternating wires of the BNG may be driven using a high-speed high-side/low-side boost driver and high voltage, high speed MOSFET switches. Electrical parameters from a previously fabricated BNG were used to simulate the BNG and evaluate the driver performance.



SPICE simulations of the BNG driver show ion pulse widths less than 35 nanoseconds. Power consumption will be evaluated and further improvements in rise time and pulse width may be possible.



MCP Signal Collector Design: Storage of data from a Constant Fraction Discriminator (CFD) or Analog-to-Digital Converter (ADC) in a high speed register to be transferred at larger intervals to an onboard computer will balance timing requirements for signal sampling and power consumption of onboard computers.



ECE Electrical + Computer Engineering

Space Dynamics Laboratory
Utah State University Research Foundation

Center for Space Engineering

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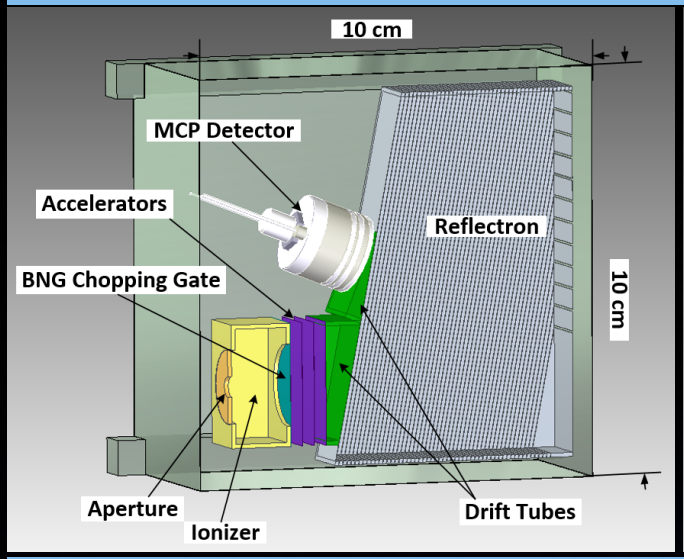

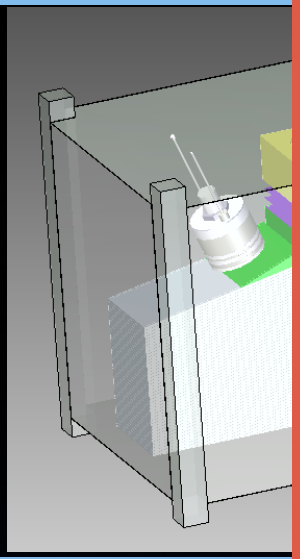

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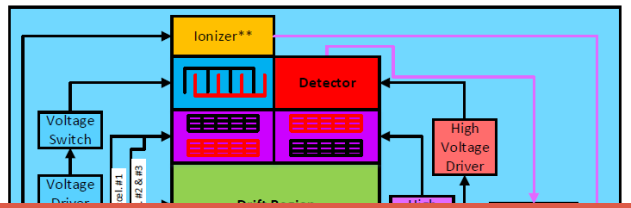

Three-column format utilizing boxed text and integrated color scheme

Student Name, *Utah State University* | Student or faculty, *Utah State University*

I. Introduction

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II. Methods

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Figure 1 – Make these visuals your focal points

III. Results

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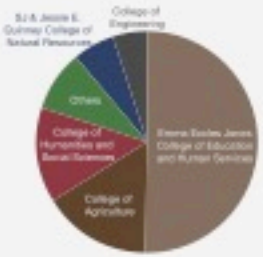

IV. Conclusions

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Study conducted with funding from a USU Undergraduate Research and Creative Opportunity Grant and lab assistance from the USU Department of Biology.

Four-column format utilizing boxed text and integrated color scheme

Student Name
Utah State University

Student or faculty
Utah State University

I. Introduction

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Table 1- A simple way to display numbers and figures

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II. Methods

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III. Results

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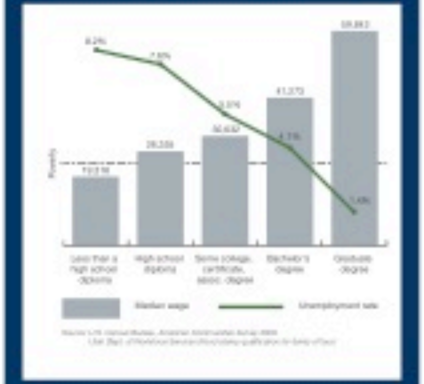
Figure 1 – Make these boxes your focal points

Figure 2 – Use great photos, charts and graphics



IV. Conclusions

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UtahState University

Study conducted with funding from a USU Undergraduate Research and Creative Opportunity Grant and lab assistance from the USU Department of Biology.

Student Name
Utah State University
Department Name
Email

LEVEL 3:
BE ATTRACTIVE.

1. LET IT BREATHE!

2. CUSTOMIZE COLORS/FONTS

SELF-ADVOCACY SKILLS

LSL Teacher Perceptions: Preschool through Third-Grade

Ariel Hendrix, B.S. (M.Ed. Candidate) & Lauri Nelson, Ph.D.

> "Children with hearing loss should learn that they have a right and responsibility to access the same educational and social experiences as their peers."

INTRODUCTION

Self-advocacy is an essential component of social-emotional skill development. For children who are deaf or hard of hearing (DHH), self-advocacy is considered especially critical, as the broader population is not always understanding of their needs. Regardless of the severity of loss, all children who are DHH need to demonstrate the ability to self-advocate across settings and may require additional support in developing these skills. Age-appropriate self-advocacy skills can and should be introduced within early intervention home-based programs and within the preschool classroom to establish the foundation for future growth and development.

METHODS

A self-advocacy ratings questionnaire for young children who are DHH was developed and distributed to preschool through third-grade listening & spoken language teachers.

Participants included 12 teachers who offered their perceptions on the self-advocacy skills of their students with hearing loss (n = 64).

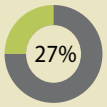
Teachers completed both quantitative and qualitative survey components that revealed information on:

- student skill level in hearing technology management, social and academic self-advocacy skills and proactive listening.
- frequency and type of self-advocacy goals listed in student Individualized Education Programs (IEPs)
- self-advocacy skills taught within the classroom
- impact of self-advocacy skill level on academic and social/emotional development
- teacher recommendations for fostering self-advocacy skill development.

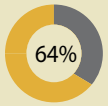
RESULTS

Teacher perceptions of skill level increased from preschool to kindergarten across all three self-advocacy priority areas (see inset).

Skill level was generally higher in areas of self-advocacy that required a lower level of skill. Skills that required higher levels of responsibility, greater expressive communication or interaction with others were identified as general areas of weakness.



of students were reported to have self-advocacy goals written in their IEPs.



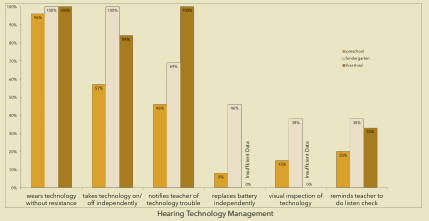
of students experienced negative effects on their academic and social/emotional development as a direct result of their self-advocacy skills.

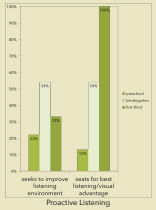
For teachers who incorporated self-advocacy skills into their classroom instruction, a majority indicated that they focused on skills that required a lower level of responsibility or technical skill (e.g., consistent wearing of hearing technology, taking technology on/off), while very few identified more difficult skills as part of their curriculum (e.g., FM system responsibility, visual inspection of technology).

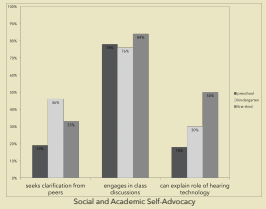
SELF-ADVOCACY IN CHILDREN WITH HEARING LOSS

SKILL LEVELS

The following graphs indicate the frequency that each skill was mostly or always exhibited across age-groups:







RECOMMENDATIONS

Children benefit when teachers foster age-appropriate self-advocacy skill development in their students across all self-advocacy priority areas and remain mindful that the level of self-advocacy skills attained in early childhood serve as a foundation for later success.

Children benefit when teachers utilize proper tools to identify areas of weakness in their students' level of self-advocacy skills and consciously incorporate them into IEP goal development and classroom instruction.

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FOR ALL WHO LOVE COLOR

LEVEL 3:
BE ATTRACTIVE.

1. LET IT BREATHE!

2. CUSTOMIZE COLORS/FONTS

3. GO BIG OR GO HOME.

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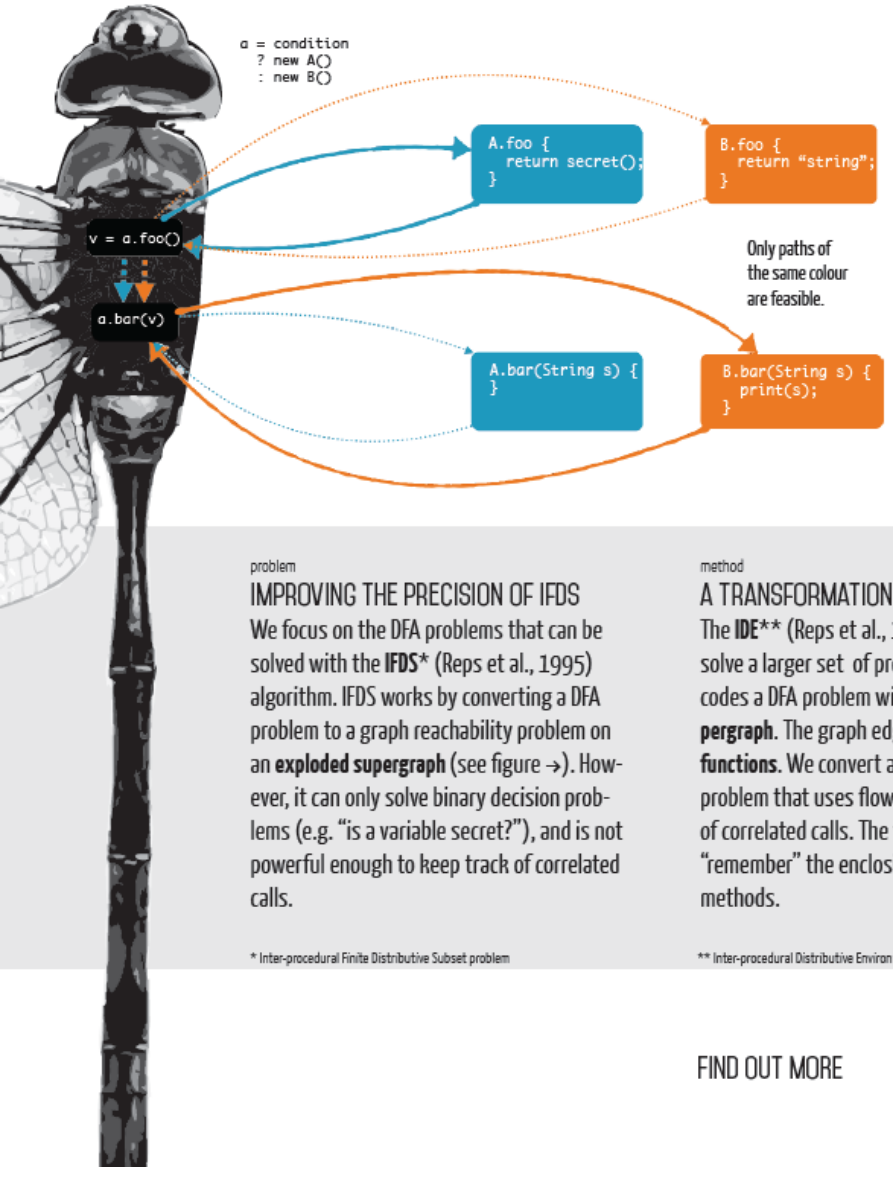
DATA FLOW ANALYSIS IN THE PRESENCE OF CORRELATED CALLS

Marianna Rapoport, Ondřej Lhoták, Frank Tip
University of Waterloo



summary

THE PRECISION OF DATA-FLOW ANALYSES CAN BE IMPROVED IN THE PRESENCE OF CORRELATED CALLS.

intro

IS YOUR DATA REALLY SECRET?

Data-flow analysis (DFA) approximates properties of programs without running them. For instance, in a **taint analysis**, we find out which variables are **secret**, e.g. to discover confidential information leaks. However, **infeasible paths** in a program's control-flow graph can affect the accuracy of an analysis.

goal

ELIMINATE INFEASIBLE PATHS

An infeasible path is one that cannot occur during program execution. In an object-oriented language, two method calls are **correlated** if they dispatch to multiple targets. The goal of this work is to **eliminate** the infeasible paths caused by correlated calls.

result

CORRELATED CALLS ANALYSIS

The correlated calls analysis improves the precision of IFDS results that contain correlated calls. Infeasible paths caused by correlated calls are removed by transforming an IFDS problem into a special type of IDE problem and solving the latter.

problem

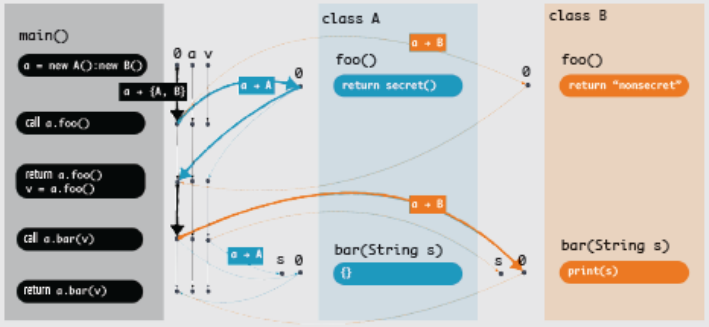
IMPROVING THE PRECISION OF IFDS

We focus on the DFA problems that can be solved with the **IFDS*** (Reps et al., 1995) algorithm. IFDS works by converting a DFA problem to a graph reachability problem on an **exploded supergraph** (see figure →). However, it can only solve binary decision problems (e.g. "is a variable secret?"), and is not powerful enough to keep track of correlated calls.

method

A TRANSFORMATION FROM IFDS TO IDE

The **IDE**** (Reps et al., 1996) algorithm can solve a larger set of problems than IFDS. IDE encodes a DFA problem with a **labeled exploded supergraph**. The graph edges are labeled with **flow functions**. We convert an IFDS problem to an IDE problem that uses flow functions to keep track of correlated calls. The flow functions serve to "remember" the enclosing classes of dispatched methods.



* Inter-procedural Finite Distributive Subset problem

** Inter-procedural Distributive Environment problem

FIND OUT MORE

- How do IFDS and IDE work?
- How are flow functions represented?
- How can we implement the correlated-calls analysis?
- How do we know the analysis is correct?

cs.uwaterloo.ca/~mrapopor


Poster 94-81
Poster 107-120
Poster 95-100
Poster 106-101
Poster 136-121
Poster 149-162
Poster 137-142
Poster 148-143
TAKE THE TEST. HOW MUCH DO YOU KNOW ABOUT...

91

A New Paradigm for Occluded Fronts and the Occlusion Process

David M. Schultz
Universities of Manchester and Helsinki, and Finnish Meteorological Institute

Geraint Vaughan
National Centre for Atmospheric Science, University of Manchester

TAKE THE TEST. HOW MUCH DO YOU KNOW ABOUT…

The Norwegian Cyclone Model?

1. An occluded front forms as a faster-moving cold front catches up to a warm front. TRUE OR FALSE?

The Shapiro–Keyser Cyclone Model?

2. Due to the T-bone in a Shapiro–Keyser cyclone (warm front perpendicular to the cold front), the occlusion process cannot occur. TRUE OR FALSE?

Warm- and Cold-Type Occlusions?

3. A warm-type occlusion forms if the air ahead of the warm front is colder than the air behind the cold front, whereas a cold-type occlusion forms if the air ahead of the warm front is warmer than the air behind the cold front. TRUE OR FALSE?

4. Which are more frequently observed: warm-type or cold-type occlusions?

Cyclogenesis and Cyclolysis?

5. The formation of the occluded front signifies an end to the deepening phase of the cyclone. TRUE OR FALSE?

Clouds and Precipitation?

6. An occluded front has the prefrontal weather of a warm front (widespread clouds and precipitation) followed by the postfrontal weather of a cold front (clear skies). TRUE OR FALSE?

Implications for a New Paradigm:

A better definition of the occlusion process is the wrap *up* of the thermal wave, narrowing of the warm sector, and the increasing separation between the warm sector and the low center.

Stronger cyclones are more likely to occlude, and weak cyclones may never occlude.

The occlusion process can be generalized to the life cycles of other cyclones.

The Norwegian cyclone model *cannot explain* the vertical structure of occluded fronts and the predominance of warm-type occluded fronts.

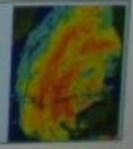
Yet, most textbooks still carry this description of occluded-frontal structures and require revision.

The merger of the cold front and the warm front is *not* the moment when the brakes of development are applied.

Instead, an occluded front is the *byproduct* of the wrap-up of the thermal wave by differential rotation around the cyclone.

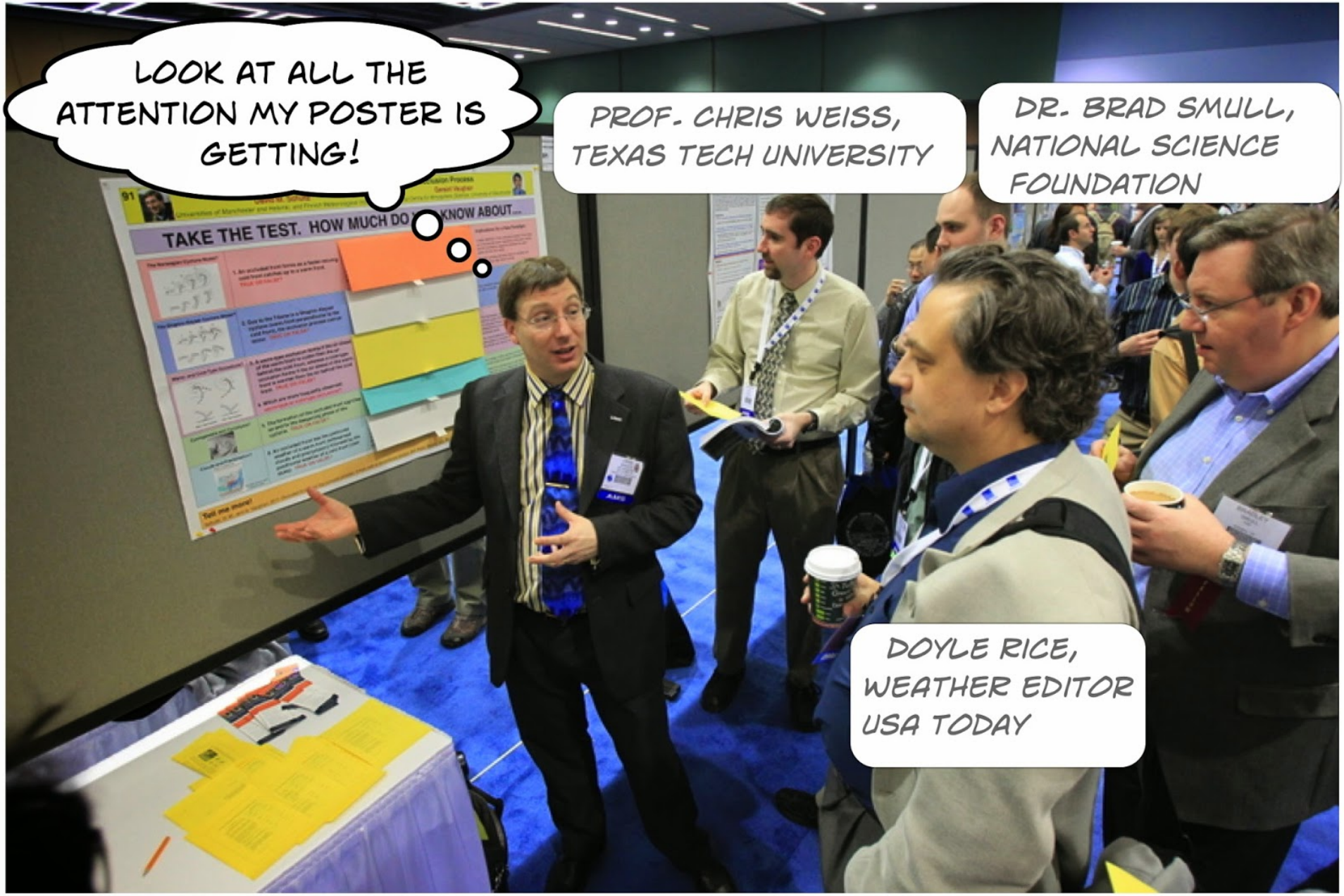
Be careful when analyzing fronts based on satellite imagery alone.

Occluded fronts are regions of active frontogenesis and can be associated with heavy precipitation, particularly to the northwest of the low center.



Tell me more!

Schultz, D. M., and G. Vaughan, 2011: Occluded fronts and the occlusion process: A fresh look at conventional wisdom. *Bull. Amer. Meteor. Soc.*, **92**, doi: 10.1175/2010BAMS3057.1.


LOOK AT ALL THE ATTENTION MY POSTER IS GETTING!
PROF. CHRIS WEISS, TEXAS TECH UNIVERSITY
DR. BRAD SMULL, NATIONAL SCIENCE FOUNDATION
DOYLE RICE, WEATHER EDITOR USA TODAY
TAKE THE TEST. HOW MUCH DO

depending on
complexity of the model.

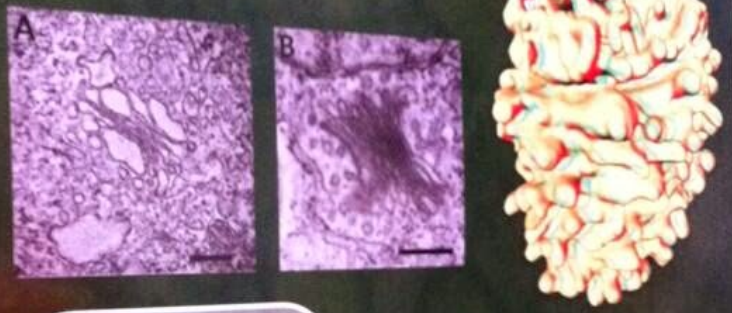
software,
the model and
it on the printer platform. The
software then generated all necessary
supports and the final file to transfer to
the printer using an SD card.

The surface model was saved
as a .stl file. Netfabb was used
to check the surface and
repaired if/as needed.

Whole cell trypanosome data (1) generated in collaboration with Sue Vaughan, Oxford Brookes University.

GOLGI APPARATUS

Golgi apparatus from human lens cells imaged using TEM (A) and in *Chlamydomonas* using FIBSEM (B). Stereo-pair image (C) of the surface model of Golgi shown in B. Scale bars are approximately 100 nm.



The Golgi apparatus is a familiar organelle in eukaryotic cells, part of the endomembrane system and involved in packaging proteins. Characteristic views of the Golgi are shown above, stacks of membranes surrounded by vesicles. Both the TEM (70nm thick section) and FIBSEM data (10nm thick slices, image shown is from a single slice) show both stacks and vesicles. When the data was reconstructed the vesicles appeared to be connected to the inter-connected membrane stacks. The 3D stereo image above shows some of this surface detail, as does the 3D model (left).

Data generated in collaboration with Chris Hawes, Oxford Brookes University.

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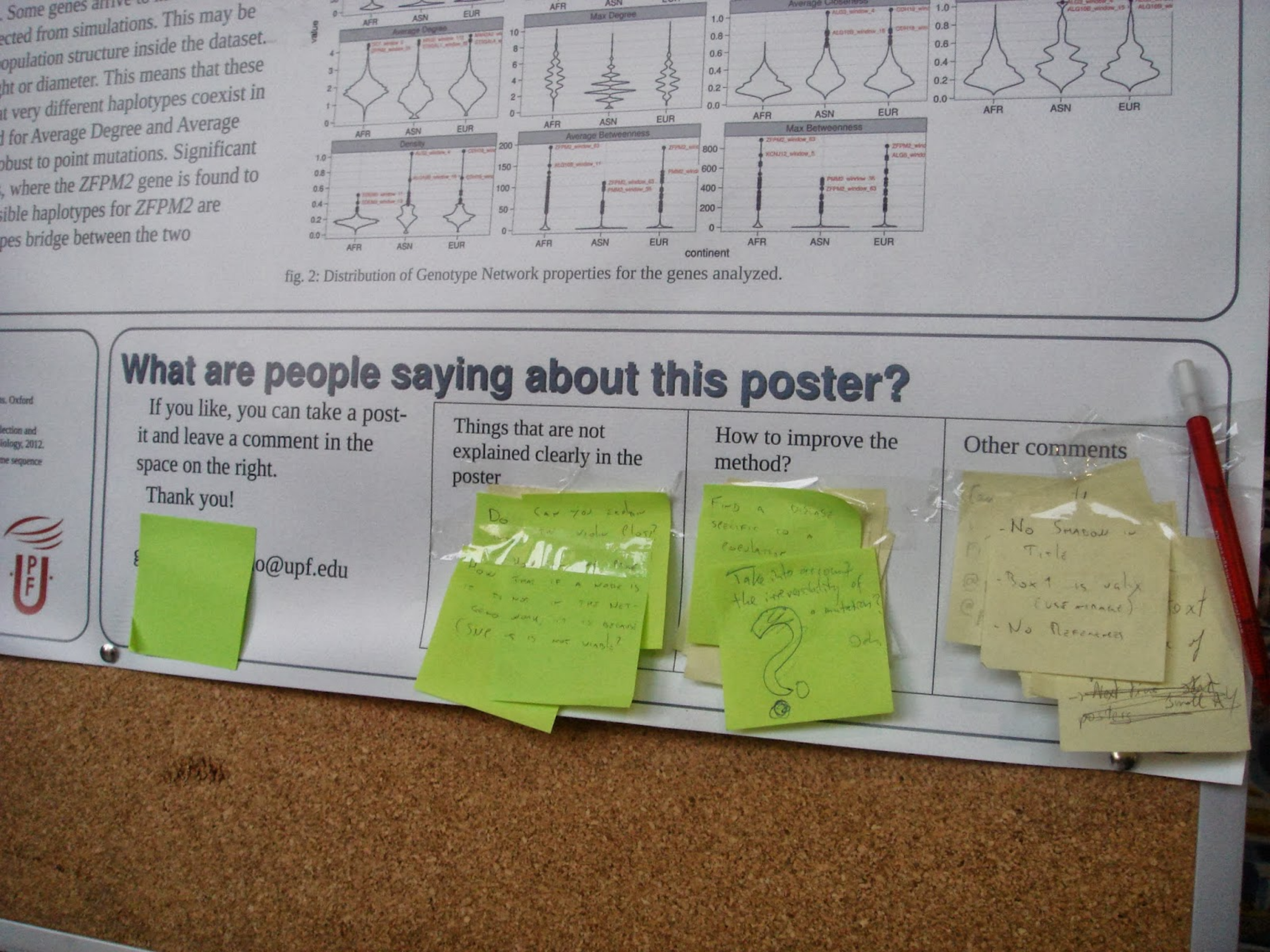

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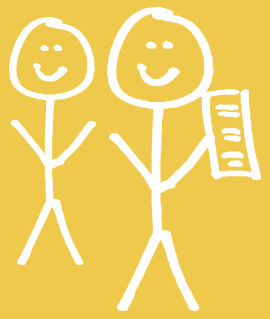
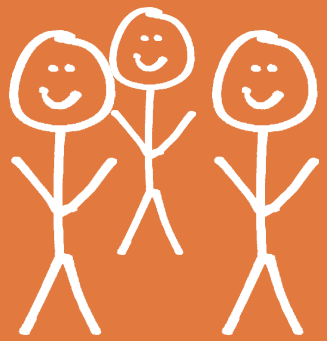
fig. 2: Distribution of Genotype Network properties for the genes analyzed.
What are people saying about this poster?
If you like, you can take a post-it and leave a comment in the space on the right.
Thank you!
o@upf.edu
Things that are not explained clearly in the poster
How to improve the method?
Other comments
Find a disease specific to a population
Take into account the irreversibility of a mutation?
- No shadow in Title
- Box 1 is ugly (use image)
- No References

LEVEL 1:
BE UNDERSTANDABLE



LEVEL 2:
BE INTERESTING



LEVEL 3:
BE ATTRACTIVE

NOW

YOU HAVE YOUR POSTER

SUPER POWERS.

Anna McEntire

DIRECTOR OF PROJECT MANAGEMENT AND COMMUNICATIONS
USU OFFICE OF RESEARCH AND GRADUATE STUDIES

ANNA.MCENTIRE@USU.EDU

How To Design Stunning Posters