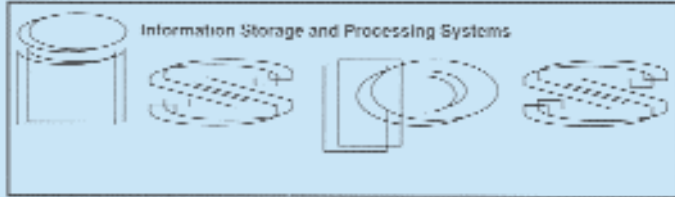




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Information Storage and Processing Systems Division Newsletter

Anand V. Lakshmikumar, Editor

Spring 2001

From the Chairman



Jonathon Wickert

On behalf of the Executive Committee, I would like to thank the members of the Information Storage and Processing Systems (ISPS) Division for their continued support. Currently, the division's activities

include organizing an annual international symposium, usually held in June at Santa Clara for the last three years. The meeting has become a focal point for addressing mechanical issues related to magnetic and optical storage devices and other computer peripherals such as printers, scanners, and paper handling equipment. Participation in the meeting, especially from the industrial community, has gradually increased over the last few years. The division also actively assists with the publication of a newly launched quarterly journal *The Journal of Information Storage and Processing Systems*, which is of interest to the ISPS community. For the last two years, select papers from the annual symposium are published in the journal in the first quarterly issue of the following year.

Since the time when ISPS was promoted to Division status of ASME, I am pleased to report that the membership in the division has grown to 338 and 409 primary and secondary members, respectively, with a total membership of 2481. The membership base is still expanding, and I

would like to encourage current members to inform your colleagues of the division's activities and benefits. As the information storage and processing industry continues its rapid growth, mechanical issues are recognized as being more important than ever. This impetus provides increased opportunities for the division's members.

I would like to thank all of you who continue to serve ASME and the division in our activities. I look forward to seeing many of you at the 12th Annual Symposium on Information Storage and Processing Systems to be held at Santa Clara, CA from June 28-29, 2001.

Jonathon Wickert
Carnegie Mellon University

ISPS Annual Symposium

ISPS had held their annual symposium in conjunction with the International Mechanical Engineering Congress and Exposition (IMECE) from 1989-1998. Presentations were solicited for delivery on relevant technologies that included magnetic and optical devices in the form of rigid disk, flexible disk, or tape media; and such processing systems as copiers, printers, digital cameras, scanners, and data servers. The following technical areas were indicative of the Symposium's interdisciplinary scope: friction, wear, lubrication, corrosion, contamination, thin films, contact mechanics, actuators, servo, motors and spindles, air flow, air-flow induced vibrations, dynamics, vibrations,

acoustics, tracking, heat transfer, image writing technologies (ink jet, thermal, laser printing, etc.), paper handling, roller mechanics, and image science.

In 1999, for the first time, ISPS held its annual symposium as a stand-alone meeting at Santa Clara University in Santa Clara, CA, from June 28-30. The technical content of the symposium had not changed but the symposium was expanded with the inclusion of workshops that covered the latest in Data Storage Technology, Interface Tribology, Servo Technology, Contact Recording, and Ink Jet Technology. It attracted 135 attendees and the 9 contributed presentation sessions (with 58 presentations, 7 of which were invited) covered topics on Hard Disk Drive Spindle and Actuator Dynamics, Shock, Acoustics, and Manufacturing, Tribology and Miniaturization, Optical and Floppy Disk Dynamics, Flexible Magnetic Media Systems, and Printer Mechanics. Tom Porter, Chief Technology Officer at Seagate Technology, spoke at the ISPS Division banquet on the *Future Directions of the Data Storage Industry*.

Starting in 1999, one paragraph presentation abstracts were reviewed for delivery at the symposium and a two-page summary was required for all accepted presentations. All authors of accepted presentations were strongly recommended to submit full manuscripts for publication (after peer-review) in the Journal for Information Storage and Processing Systems (JISPS). Information about the symposium and ISPS division in general was constantly

(continued on page 2)

ISPS Annual Symposium

(continued from page 1)

updated at ISPS's own web site <http://www.asme.org/divisions/isps>. The volunteer organizing committee, learning from the experience of ISPS '99 and thoughtful feedback from its participants, made every effort to make the symposium a success in 2000. ISPS '00 was the 11th annual ISPS symposium and was held at the same location from 26-28, 2000.

The symposium combined the best in workshops covering the state of the art in Hard Disk Drive Design, Head-Disk Tribology, Magnetic Tape Storage, and Optical Storage. The nine contributed presentation sessions with 64 papers covered topics on Hard Disk Drive Spindle and Actuator Design/Dynamics, Hard Disk Drive Servo Control, Head-Disk Interface, Flexible Media Mechanics, Magnetic Tape Storage Systems, and Paper and Printer Mechanics. James Porter of Disk Trend spoke at the ISPS Division banquet on *The Disk Drive Industry's Dynamic Past — and Future*. The banquet and the conference lunches gave ample opportunity for the symposium attendees to mingle with their peers. It was attended by 103 attendees distributed over USA (77), Asia (25), and Europe (1) and from the industry (64) and academia (39).

The 12th annual ISPS symposium is also going to be held in the same location from June 28-29, 2001 and the advance program is attached. The program will be updated with any unforeseen changes at the ISPS web-site. The ISPS division is thankful to all the presenters, attendees, session organizers, session chairs, and the members of the executive committee of the ISPS division who together helped in organizing the last couple of symposiums. The feedback received from the participants of ISPS '99 and ISPS '00, were also helpful. The ISPS division look forward to continued participation by members (and non-members) in the future and invite everyone to continue to provide ample feedback for future annual symposiums and to volunteer to help achieve it. The division is also thankful to Santa Clara University for letting us use of their facilities for the conference.

ISPS Journal

A quarterly journal, the **JOURNAL OF INFORMATION STORAGE AND PROCESSING SYSTEMS (JISPS)** has been published since January 1999, by Birkhauser Boston, a division of Springer International. Updated information about the journal is available at <http://www.birkhauser.com/jips>. For the past two years, JISPS has been publishing selected papers from Annual ISPS Symposia. Papers from ISPS '99 and ISPS '00 were published in Volume 2, Issue 1/2 and Volume 3, respectively.

Aim and Scope of the Journal

The journal reports the latest research from around the world in all the electromechanical, materials science, design, and manufacturing problems associated with information storage and processing systems. This includes magnetic recording, optical recording, computer peripheral devices (copiers, printers, scanners and digital cameras) and other evolving storage and information processing systems. The following non-exhaustive list is indicative of the scope of topics covered by the journal: Friction, Adhesion, Wear, Lubrication, Solid Mechanics, Air flow, Contamination, Instrumentation, Dynamics, Shock and Vibration, Control, Head and Suspension Design, Actuators, Spindle and Actuator Motors and Bearings, Structure of Thin Films, Corrosion, Long-Term Reliability, Materials and Processing, Web Handling, Manufacturing and Automation, and Economics. Each issue contains primary research articles and occasionally feature review articles. All articles are of international archival quality, refereed according to rigorous standards by the editors and their reviewers.

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Send 5 copies of the manuscript for review to the Editor-in-Chief - Dr. Bharat Bhushan. All submissions are subject to peer review and editorial control of length and style. Indicate clearly whether an article is to be considered for publication as a research article or as a review article. Research articles describe important analytical, experimental, or empirical results, which add to our knowledge in one or more of the many problem areas of this subject. Although the scope of such articles may be narrow, each must address specifically how the new results are expected to influence practice. Review articles, on the other hand, are intended to present considered and objective assessments of a technology or area of practice. They may or may not be based on analytical or experimental models, but if not, they should offer substantive evidence to support the main thesis. As in the case of research articles, review articles must clearly present the implications for future practice.

12th Symposium on Information Storage and Processing Systems (ISPS '01)

Santa Clara University, Santa Clara, California, USA

June 28-29, 2001

(SUBJECT TO CHANGE: Updated info. at <http://www.asme.org/divisions/isps/isps2001.html>)

The Twelfth Symposium on Information Storage and Processing Systems will feature presentations on relevant technologies including magnetic and optical devices with either rigid disk, flexible disk, or tape media; and such processing systems as copiers, printers, digital cameras, scanners, and data servers.

The Symposium's interdisciplinary scope covers a broad range of technical areas, comprising friction, wear, lubrication, contact mechanics, contamination, image writing technologies (ink jet, thermal, laser printing, etc.), paper handling, roller mechanics, image science, air flow, heat transfer, dynamics, vibration, acoustics, actuators, tracking, corrosion, and thin films.

The symposium is an industry oriented event with heavy participation from data storage and information processing industries from North America, Europe, and Asia. Such participation covers soliciting papers, chairing sessions, presenting, and attending. With presentations emphasizing practical applications and problem solving, it is the aim of the symposium to provide attendees with an excellent blend of the best of industry needs, inventions, and technology breakthroughs, and the latest advancements and discoveries in research labs in universities around the world.

Registration Fees

	Full Conference		Single Day	
	Member	non-member	Member	non-member
Pre registration (until June 15, 2001)	\$220	\$270	\$150	\$200
Advanced 6/16-6/27 & Day of:	\$295	\$345	\$200	\$250

Session 1: Tribology I 9:00 am - 12:20 pm, Thu. June 28

9:00 am (Invited)

9:40 am Ramp Loading "Sweet Spots",
J. R. Yaeger and B. Hiller, Maxtor Corp.

10:00 am Ramp Unloading "Footprints",
J. R. Yaeger and B. Hiller, Maxtor Corp.

10:20 am Impact Rebound Type Inertia Latch for Load/Unload Technology, Y. Byun, J. Kang, J. Chang, V. Sharma, and H. Lee, Samsung, San Jose, CA

10:40 am Break

11:00 am Spindle Power Comparison Between Load/Unload and Contact Start/Stop Disk Drives, K. Schouterden, B. Feliss, M. Suk, D. Gillis, and R. Wolter, IBM

11:20 am Detection of Slider-Disk Contacts During Load/Unload, J. D. Limmer, Seagate

11:40 am Development of Novel PZT Thin Films for Active Sliders Based on Head Load/Unload on Demand Systems, N. Tagawa, H. Seki*, K. Kitamura, and A. Mori, Kansai University, *Hitachi, Ltd.

12:00 noon. A Lubrication Equation with Both Surface Roughness and Gas Rarefaction Effects, X. Zhang, B. Tan and J. T. Ma, Santa Clara University, Santa Clara, CA

Session 2: Actuator/Motor I 9:00 am - 12:20 pm, Thu. June 28

9:00 am (Invited)

9:20 am Design and Study for Integrated PZT Micro-actuator Read/Write Devices, L. Yi, C. Shix-

in, M. Jianquiang, Data Storage Institute, Singapore

9:40 am Push-Pull Multi-Layered Piggyback PZT Actuator, S. Nakamura and H. Numasato, Hitachi, Ltd., Kanagawa, Japan

10:00 am Quality Based Design Approach for a Single Crystal Silicon Microactuator Using DOE Technique and Response Surface Model, S. Chen, J. Yang, J. Mou, and Yi Lu, Data Storage Institute, Singapore

10:20 am System Design for an Actively Controlled Disk Drive Actuator, R. J. McNab, J. Yu, H. Melkote, and C-P Roger Ku, Western Digital Corp., San Jose, CA

10:40 am Break

11:00 am (Invited) Hydrodynamic Bearing Spindle Motors for Hard Disk Drives, C-P Roger Ku, Western Digital Corp., San Jose, CA

11:40 am Prediction method of oil leakage of FDBs using numerical analysis, H. Kita, K. Matsuoka, S. Obata and H. Noda

12:00 noon. Groove Design of Hydrodynamic Bearing for HDDs, T. Asada, H. Saitoh, K. Itoh, Matsushita Electric Industrial Co., Ltd., Osaka, Japan

Session 3: Optical I 9:00 am - 12:20 pm, Thu. June 28

9:00 am (Invited) Recent Progress Of Magneto-Optical Storage And Prospects Of Near Field Recording, J. H. Kim and S. K. Kim, LG Elite, Seoul, Korea

9:40 am Air-Bearing Design and Flying Characteristics of Flexible Optical Head Slider Combining with

Visible Laser Light Guide, T. Hirota, T. Ohkubo, K. Itao, University of Tokyo, Tokyo, Japan

10:00 am Analysis of Particle Contamination of Far-Field Magneto-Optical Sliders for Removable Storage, J.C. Van der Hoeven, Philips Research Laboratories, Eindhoven, The Netherlands

10:20 am Novel PZT Dual Actuator with Fast Seeking and Tracking Servo Method for Optical Disk Drive, W. Cho, N. C. Park, H. S. Yang, and Y. P. Park, Yonsei University, Seoul, Korea

10:40 am Break

11:00 am Optical Recording System Using an Integrated Solid Immersion Lens, T. Song, H. D. Kwon, M. D. Yi, N. C. Park, and Y. P. Park, Yonsei University, Seoul, South Korea

11:20 am Mechanical Characteristics of a Contact Optical Head Slider Operating on a Metal Layered Medium, T. Ohkubo, N. Shou, K. Tanaka, T. Hirota, H. Hosaka, and K. Itao, University of Tokyo, Tokyo, Japan

11:40 am Vibrational Positioning Method for Optical Fibers Sliding on a Frictional Surface, H. Hosaka, N. Nagaki, T. Suzuki, and K. Itao, University of Tokyo, Tokyo, Japan

12:00 noon A Three-Dimensional Dynamic Analysis of an ABB with Consideration of Bearing Clearance of the Spindle Motor, Y. D. Huang, C. P. Chao, and C. K. Sung, National Tsing Hua Univ., Hsinchu, Taiwan

Session 4: Tribology II 2:00 - 5:00 pm, Thu. June 28

2:00 pm (Invited) Challenges for the Extensibility of Magnetic Recording Media, S. Suzuki, and D. Wachenschwanz, Komag, San Jose, CA

Highlights:

Single Conference fee includes the following:

- 8 invited presentations
- 12 contributed presentation sessions
- 2 networking lunches
- ISPS Division banquet with Invited Speaker

Date	Time	Track 1	Track 2	Track 3
Thu 6/28/01	8:00 am - 5:00 pm	Registration		
	9:00 am - 12:20 pm	SESSION 1: Tribology I	SESSION 2: Actuator/Motor I	SESSION 3: Optical I
	12:20 pm - 2:00 pm	Lunch		
	2:00 pm - 5:00 pm	SESSION 4: Tribology II	SESSION 5: Motor II	SESSION 6: Optical II
	7 pm - 9 pm	ISPS Division Awards Banquet		
Fri 6/29/01	9:00 am - 12:30 pm	Registration		
	9:00 am - 12:20 pm	SESSION 7: Flexible Media	SESSION 8: Flow I	SESSION 9: Servo I
	12:20 pm - 2:00 pm	Lunch		
	2:00 pm - 5:00 pm	SESSION 10: Tribology III	SESSION 11: Flow II	SESSION 12: Servo II

2:40 pm *Calculated Mechanical Film Properties of Cubic Materials: A Comparative Study*, P. M. Jones, J. Kiely and Y. T. Hsia, Seagate, Pittsburgh, PA

3:00 pm *Quantitative Study of Lubricant Puddling at the Head/Disk Interface*, Q. Zhao, Z. Zhao, S. Lee, E. Karazic, M. Mendez, G. Barth, and C. Tzeng, Seagate, Milpitas, CA

3:20 pm *Break*

3:40 pm *Tribological Performance of Nano- thin Fluoropolymer Coated Sliders*, B. Liu, Y. Ma, and Y. Man, Data Storage Institute, Singapore

4:00 pm *An Electromagnetic Read/Write MFM Probe*, J. F. C. Windmill, W. W. Clegg, D. F. L. Jenkins, P. J. Davey, University of Plymouth, Plymouth, UK

4:20 pm *A Preliminary Lifetime Performance Degradation Model for Hard Disk Drives in Consumer Electronics Applications*, S.E.Franklin and R.Severt, Philips CFT, Eindhoven, The Netherlands

4:40 pm *Understanding low flying head-disk interface performance through Take-off Pressure (TOP) testing*, V. Raman, D.R. Gillis, K. Schouterden, and R.W. Wolter, IBM, Storage Systems Division, San Jose, CA

Session 5: Motor II
2:00 - 5:00 pm, Thu. June 28

2:00 pm *Dynamic Performance of a Herringbone Grooved Journal Bearing in a HDD Due to Groove Location*, G.H. Jang and J.W. Yoon, Hanyang University, Seoul, Korea

2:20 pm *Lubricant Evaluation Method for HDDs Using TOF-SIMS*, K. Matsuoka, S. Obata and F. Toujou, Matsushita Electric Industrial Co., Ltd., Osaka, Japan

2:40 pm *A Bi-directional Fluid Bearing System*, Q.D. Zhang, S.X. Chen, S.H. Winoto, and J.P. Yang, Data Storage Institute, Singapore

3:00 pm *Analysis and Design of Hydrodynamic Journal Air Bearings for High Performance HDD Spindle*, T. Hwang and K. Ono, Tokyo Institute of Technology, Tokyo, Japan

3:20 pm *Break*

3:40 pm *Development of Electrochemical Micro-Machining for Air-Lubricated Hydrodynamic Bearings*, E. S. Lee, C. H. Won and J. W. Park, Inha University, Korea

4:00 pm *Development of Herringbone Grooved Fluid Film Bearing and Air Bearing for Laser Printer*, S. H. Jeong*, Y. Z. Lee*, K. S. Jeong**, and D. H. Jeong**, *Sungkyunkwan University, ** Samsung Electromechanics Co., Korea

4:20 pm *Transient Dynamic Analysis of Ferro-Fluid Bearing Spindle Motor*, J. Yang, S. chen and Q. Zhang, Data Storage Institute, Singapore

4:40 pm *Effects of HDD Base Castings and Top Covers on Disk and Spindle Vibration*, J. Y. Shen and I.Y. Shen, University of Washington, Seattle, WA

Session 6: Optical II
2:00 - 4:20 pm, Thu. June 28

2:00 pm *Dynamic Analysis of Ball Balancer with Triple Races*, E. H. Cho*, S. H. Choa and J. Chung, Samsung Electronics Co., Kyunki-Do , Korea

2:20 pm *Readout Signal Evaluation of Optical Flying Head Slider with Visible Light-Wave Guide Flexure*, T. Ohkubo, T. Hirota, and K. Itao, University of Tokyo, Tokyo, Japan

2:40 pm *Real-time synchronous Observation of switching Dynamics in magneto-Optical media*,

W. Clegg, D. Jenkins, N. Helian, J. Windmill, R. Windmill, R. Atkinson, B. Hendren, and C. D. Wright, University of Plymouth, Plymouth.

3:00 pm *Precise tracking control system of the magneto-optical disk drives using galvano mirror*, H. Kobayashi, T. Kawabe, I. Watanabe and J. Ichihara, Fujitsu Labs. Ltd, Kawasaki, Japan

3:20 pm *Break*

3:40 pm *Low-Complexity Detection Techniques for Run-Length Limited Codes with $d=2$* , H. Cho, S. Ong, C. Kang, and D. Hong, Yonsei University, Seoul, Korea

4:00 pm *Electron Beam Mastering for High Density Optical and Hard Disk*, G. Cartwright, G. Reynolds, C. Bayliss, A. Pearce C. Dix, and N. Ogilvie, Nimbus Technology & Engineering Limited, Monmouth, UK.

Session 7: Flexible Media
9:00 - 12:00 pm, Fri. June 29

9:00 am *Magnetic Tape Path Guide Simulation*, T. Machida and J.A. Wickert, Carnegie Mellon Univ., Pittsburgh, PA

9:20 am *Tape Traction Over Rollers and Posts*, S. M. ft., Northeastern University, Boston, MA

9:40 am *Friction, Wear, and Mechanical Properties of Magnetic Tape-Head Materials and their Influences on PTR*, B. Bhushan, X. Li, and W. W. Scott, Ohio State University, Columbus, OH

10:00 am *Long-term Mechanical and Viscoelastic Behavior of Constitutive Polymeric Materials used for Magnetic Tapes*, B. L. Weick* and B. Bhushan**, *University of the Pacific, Stockton, CA, **Ohio State University, Columbus, OH

10:40 am *Break*

11:00 am *A Novel Contact Slider/ Suspension to Achieve Highest Recording Density in Flexible Disk Drives*, H. Ryoson, M. Kondo¹, K. Goto, T. Kawashima, S. Nagata¹, Y. Muraoka, Y. Matsui¹, Y. Kaneta¹, and Y. Okazaki, SONY Corporation, Japan, ¹Daido Steel Co., Ltd, Japan

11:20 am *Vibration Analysis and Passive-control Method for a Contact Slider/Suspension of "CFDD"*, Y. Muraoka, H. Ryoson, T. Kawashima, M. Kondo¹, Y. Kaneta¹, and Y. Okazaki, SONY Corporation, Japan, ¹Daido Steel Co., Ltd., Japan

11:40 am *A Mechanism for Flattening Papers in Automated Teller Machines By Heat and Pressure*, A. Mochizuki, Hitachi, Ibaraki, Japan

12:00 pm *A Stacking Mechanism for Setting Papers Upright in Automated Teller Machines*, A. Mochizuki, Hitachi, Ibaraki, Japan

Session 8: Flow I
9:00 am - 12:20 pm, Fri. June 29

9:00 am (Invited) *Numerical Modeling Of Flow-Induced Suspension Vibrations In 2d Geometries Relevant To 3d Disk Drives*, J. A. C. Humphrey^{1,2}, L. Rosales³, H. Haj-Hariri², and K. Darvish²

9:40 am *Low Windage and Low Flying Height Head Suspension Assembly for 40 Gb/in²*, H. Takahashi, K. Wakatsuki, K. Takahashi, and S. Nakamura, Hitachi, Japan

10:00 am *Flow Induced Vibration of Head Gimbal Assembly*, C. W. Jen, C-P Roger Ku, A. Hanna, and L. Yang, Western Digital Corp., San Jose, CA

10:20 am *Influence Of Disk Spacing On Air Flow*

Excitation In Disk Drives, S. Tadepalli and S. Xia, Seagate

10:40 am *Break*

11:00 am *Observing Hard Disk Drive Suspension Arm and Disk Vibrations*, G. Tunstall, W. Clegg, D. Jenkins, P. Davey, and A. Liu, University of Plymouth, Plymouth, UK

11:20 am *Air Flow Velocity Measurements In a Seagate Hard Disk Drive*, R. N. Parthasarathy and J. Kim, University of Oklahoma. Norman, OK

11:40 am *Analysis of the Turbulent Boundary Layer a Rotating Disk*, R. N. Parthasarathy, University of Oklahoma, Norman, OK

12:00 noon. *Acoustic-Structure Interaction of Disk Platter Spinning in a Cavity*, N. Kang and A. Raman, Purdue University, West Lafayette, IN

Session 9: Servo I
9:00 am - 12:20 pm, Fri. June 29

9:00 am (Invited) *Design of Dual Stage Track-Following Servo Systems*, R. Horowitz and Y. Li, University of California, Berkeley, CA

9:40 am *Dual-stage Servo Schemes and Design Philosophies*, X. Hu and L. Guo, Maxtor Corp, Milpitas, CA

10:00 am *Neural Network Based Friction Modeling and Adaptive Robust Control of Hard Disk Drives*, J. Q. Gong and B. Yao, Purdue University, West Lafayette, IN

10:20 am *Design and Analysis of Dual-Stage Servo System for High Track Density HDDs*, C. C. Chung, Hanyang University, Seoul Korea

10:40 am *Break*

11:00 am *Comparison of Robust Track-Following Controller Performance Against External Disturbances of Hard Disk Drives*, H. S. Lee and L. Guo, Maxtor Corp, Milpitas, CA

11:20 am *Robust Digital HDD Track-following Compensator Design*, J. Yu, Western Digital Corporation

11:40 am *Servo Patterns in Patterned Media*, W. C. Messner, Carnegie Mellon University, Pittsburgh, PA

12:00 noon. *Rejection of Repeatable and Non-repeatable disturbances for disk drive Actuators*, J. Li and T. C. Tsao, University of California, Los Angeles, Los Angeles, CA

Session 10: Tribolog III
2:00 - 5:00 pm, Fri. June 29

2:00 pm (Invited)

2:40 pm *Simplified Approach of Model Analysis Using Finite Element Method for Viscoelastic Damping Treated Structures*, Y. Xu and B. Wang, Maxtor Corporation, Milpitas, CA

3:00 pm *Model Updating of HDD Head Stack Assembly Using Model Tuning Technique*, J. K. Lee, D. W. Kim, N. C. Park, and Y. P. Park, Yonsei University, Seoul, Korea

3:20 pm *Break*

3:40 pm *Numerical Simulation of Shock Response of Disk-Suspension-Slider Air Bearing Systems in Hard Disk Drives*, Q. H. Zeng* and D. B. Bogy**, *IBM Almaden Research Center, San Jose, CA, ** Univ. of California, Berkeley, CA

4:00 pm *An Integrated Approach on Acoustics for Application Boxes With Internal HDDs*, A.C. Geerlings, Philips CFT, Eindhoven, The Netherlands

4:20 pm Use of MEMS Based Accelerometers in Hard Disk Drives, Roberto Oboe, Università di Padova via Gradenigo, Padova, Italy

4:40 pm Particulate Contamination of Electroless Nickel Plating Applied over High Stiffness Materials, W. Prater, M. Baldwin, D. Braunstein, W. Chung, R. Nagarajan, D. Scott, G. Stone, and G. Washington, IBM, San Jose, CA

Session 11: Flow II
2:00 - 5:00 pm, Fri. June 29

2:00 pm Aeroelastic Flutter of Circular Rotating Disks: A Simple Mathematical Model, H. Kim and A. A. Renshaw, Columbia University, New York, NY

2:20 pm Pressure Maps of Velcro Treatments to Reduce Aerodynamic Disk Flutter at High Spin Speed, B. Heo and I. Y. Shen, University of Washington, Seattle

2:40 pm Fluid Measurements in Micro/Nano Domains, S. Wereley, Purdue University, West Lafayette, IN

3:00 pm Investigation and Characterization of Air-flow Effects and Airflow-Induced TMR Past Inline Type Suspensions Between Co-Rotating Disks, T. Watanabe, H. Gross, O. Savas, and D. Bogy, Univ. of California, Berkeley, CA

3:20 pm Break

3:40 pm Critical and Flutter Speeds of Optical Disks, S.Y. Lee*, J. D. Kim* and S. K. Kim**, *Sogang University, Seoul, Korea, **LG Electronics, Seoul, Korea

4:00 pm Numerical Simulations of Self-Excited Instability of a Flexible Disk Rotating near a Base Plate, G. Naganathan, S. Ramadhyani, and A. K. Bajaj**, Seagate Technologies, Longmont CO, **Purdue University, Lafayette, IN

4:20 pm Observing Hard Disk Drive Suspension Arm and Disk Vibrations, G. Tunstall, W. Clegg, D. Jenkins, P. Davey, and A. Liu, University of Plymouth, Plymouth, UK

4:40 pm Experimental Investigation of Flow Induced Out-of-plane Disk Vibration in Hard Disk Drives, J. O'Young and C-P. Roger Ku, Western Digital Corporation, San Jose, CA

Session 12: Servo II
2:00 - 3:40 pm, Fri. June 29

2:00 pm Optimization Based Design Of Low-Complexity Repetitive Controllers, Craig Smith, Texas A&M University, College Station, TX

2:20 pm Effects of Non-minimum-phase Zeros on HDD Servo System Performances, Q. Hao, Z. He, H. Quan, and G. Guo, Data Storage Institute, Singapore

2:40 pm Robust Control of a Dual-stage Actuator

for Hard Disk Drives, S. H. Lee and Y. H. Kim, Samsung Advanced Institute of Technology, Suwon, Korea

3:00 pm A Dual-Stage Control Algorithm for Disk Drives Based On Coarse Actuator Motion Preview, Y. H. Kim and S. H. Lee, Samsung Advanced Institute of Technology, Suwon, Korea

3:20 pm Active Resonance Control for High Speed and High TPI Hard Disk Drives, S. M. Suh, C. C. Chung, and S. H. Lee, Hanyang University, Seoul Korea

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Calendar of Relevant Events

2001

June 25 - 28: NSIC Annual Meeting DoubleTree Hotel, Monterey, CA
(<http://www.nsic.org>)

August 20-22: TMRC - Heads, Minneapolis, MN (<http://www.ieemagnetics.org>)

October 22-24: ASME/STLE International Joint Tribology Conf., San Francisco, CA
(http://www.stle.org/trib_conf_2000/trib_conf_2001_call.htm)

November 11-16: International Mechanical Engineering Congress & Exposition (IMECE)
New York, NY (<http://www.asme.org/conf/congress01>)

November 12-16: 46th Conference on Magnetism and Magnetic Materials
Westin Seattle Hotel, Seattle, WA
(<http://www.aip.org/mmm/futureconf.html>)

2002

April 28 - May 2: INTERMAG Conference, Amsterdam, The Netherlands
(<http://utep.el.utwente.nl/tdm/istg/intermag>)

SOME OBSERVATIONS ON SKILLFUL PROPOSAL WRITING

As the Director of Dynamic Systems and Control Program at the National Science Foundation (NSF) from 1992 to 1998, I had the opportunity to go through a large number of proposals that were submitted for funding consideration. In reviewing these proposals, I found a number of attributes that made a few of these proposals really stand out. Such proposals were unanimously recommended by the reviewers for funding. In this article, I would like to share my thoughts on writing meritorious proposals with DSCD members.

Faculty members at research-oriented institutions are called upon to assume a variety of roles that have a major impact on promotion and tenure decisions. For example, they are expected to teach well; generate large amounts of external funding; supervise research projects of graduate and undergraduate students; and publish scholarly papers in peer reviewed journals. In addition, they are expected to participate in professional society meetings; take a leadership role in professional society sponsored activities; and of course, serve the community inside and outside the university.

In spite of sponsored research funds being made available by a large number of state and federal government agencies, private corporations, philanthropic foundations, and the like, still there are not enough resources available to fully meet the national needs. The competition for research dollars is very intense now, and will continue to remain as such in the future. An organized effort and care in preparing a thoughtful proposal is a justified investment leading to potential success in the competition. Preparing an excellent proposal is indeed hard work and time-consuming; however, the pay-off makes the effort invested in this exercise extremely worthwhile.

In order to develop a successful proposal, it is indeed of foremost importance to have a meritorious idea worthy of funding. In addition, the area chosen for preparing a proposal must be of interest to the funding agency. Different agencies may have different announced areas of emphases for providing support for research projects. Also, the application procedure and guidelines for preparing proposals may widely vary. In the following discussion, the guidelines for developing a proposal for possible funding by NSF are given. The material primarily incorporates the information provided by NSF in the proposal development and submission document.

The key to a good proposal is a good idea that is well-expressed, with a clear indication of the methods for pursuing the idea, evaluating the findings, and making them understood to all those who need to know. Specifically, it should very clearly answer the following vital questions. What do you intend to do? Why is this work important? What has already been done and is known about the problem? What approach are you planning to take to solve the problem? What is innovative and novel about your

approach? What kind of impact is your research likely to have locally, nationally, or internationally? How will the research influence the educational environment?

In your role as an individual investigator, you should develop and establish long-term research goals or plans. You can develop and refine a bright idea by carrying out a thorough literature search, contacting investigators working on the topic, preparing a brief concept paper, and discussing your idea with your colleagues and mentors. In preparation for doing the research you must determine the available resources and the support structure, realistically assess the requirements, develop preliminary data, and present this information to your colleagues, mentors, and/or students. By doing this you will be using your immediate contacts as a sounding board.

You should carry out a thorough search for existing possible funding sources. The information available on internet through the world wide web is a good starting point for this purpose. You should ascertain the overall scope and mission of the sponsoring agencies. Pay particular attention to their announcements and identify where your project will best fit. Become familiar with the review procedure and evaluation criteria. In the case of NSF, this information is posted on the web (www.nsf.gov), and is also printed on the back of the proposal review form.

Generally, it is an excellent idea to discuss your potential project with the relevant program officers to ascertain their possible interest in the proposed area, and to find out specific program requirements and limitations, current program patterns, and their views on the essential ingredients of a successful proposal. Coordinate your efforts with your institutional Sponsored Research Office.

Your proposal should include a very clear statement of the problem to be solved. You should demonstrate in your narrative a genuine need for a solution of the problem. Emphasize the significance of the proposed work by citing relevant background literature and gaps to be filled, and justify that it will make a real difference both inside and outside the discipline if the solution to the problem is found. Discuss the feasibility of the proposed research via testable valid hypotheses, your professional qualifications and background experience as a capable and suitable investigator, and the availability of resources and preliminary data.

An experimental plan, if used as an integral part of your project, should be described in clear terms to include a response to the following questions. What specific methodology do you propose to use? Is it feasible, adequate, and appropriate? What are the assumptions you are making? What innovations are you likely to bring in your proposed approach? Are there any difficulties you anticipate with your approach? What if you later find out that the approach does not work? Do you have alternate plans to tackle the problem?

Be sure to include a timeline in your pro-

ject proposal. This should consist of the sequential and concurrent steps you plan to execute, and the time period over which each activity will take place. Discuss in detail what outcomes you anticipate, how you plan to collect and analyze the data, how you would assess and validate the results, and how you would disseminate the results. If the project is a continuation of your research activities, what plans do you have for its continuation beyond the grant period, and what are the long-range research plans so that the project results will have an impact locally, regionally, and nationally.

Utilize the available expertise to the fullest extent as you prepare the project description. This includes input from your colleagues, mentors and peers. If the proposal is being prepared following the review of a pre-proposal (or it is a revised submission of an earlier proposal), the comments offered by the reviewers must be adequately addressed. In addition, the input and informal advice of the Program Officer handling the review could be most helpful.

It is important to develop the ideas clearly and logically, putting the essence of work being proposed in the beginning, ensuring a coherent direction, and organizing the manuscript such that it is easy to be skimmed by the reviewer at its first reading. Explain all matters clearly without assuming that the reader, i.e., the reviewer, will necessarily know what you meant. The readability can be improved by using clarifying material and style, such as well-designed visuals, and highlighting main points. Address in the project narrative the evaluation criteria, making sure that any special requirements have been included, and convey to the reviewer a sense of enthusiasm for your work.

It must be emphasized that you should pay special attention to the page limits specified by the funding agency. For example, unless otherwise specified, the National Science Foundation has imposed a limit of 15 pages on the project description portion of the proposal. Appendices can be included only if allowed by a specific program announcement, or if approved in advance by the appropriate NSF Assistant Director or designee. As far as possible, in your text use a concise scientific writing style using simple sentence structure, spelling out acronyms at their first usage, and avoiding jargon. Allow enough time for a thorough editing and proofreading. Misspelled words and poorly constructed sentences cause a lot of distractions and take away from the essence of the message you might be trying to convey. When you assemble the package together, keep it neat and verify that it is complete in all respects before mailing. Of course, make sure that it definitely reaches the sponsoring agency by the announced deadline.

Happy proposal writing and best wishes for achieving success in your goal!

Dev Garg