

Matter of Opinion

To Read Is Human, to Watch Divine—Engineering EML Webinar

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Extreme Mechanics Letters, an Elsevier journal, has recently launched a weekly EML Webinar, an online meeting place for mechanicians and their friends, worldwide. The lectures and discussions shed light on the forefront of research and the formative years of researchers, no travel required. Speakers and videos are updated at <http://iMechanica.org/node/24098>.

On March 27, an email came to me from Professor Yujie Wei of the Institute of Mechanics, the Chinese Academy of Sciences, Beijing. “Our graduate students have stayed home for more than two months,” he wrote. “Would you be willing to give a seminar to all our graduate students (about 300) and faculty members through teleconference?” Giving a talk to the legendary institute without having to travel instantly appealed to me. I had never given a webinar before but (because of the global pandemic) had been teaching a graduate course to a class of over 20 people since March 12 on Zoom. Zoom was little known in China then, but our Chinese colleagues had been teaching on other teleconference platforms for months. “How many attendees could your Harvard Zoom account allow?” Yujie knew what to ask. I forwarded his question to Harvard IT. “300,” replied Mike Rowe, “but I can bump you up to 500.” In subsequent weeks, Mike went out of his way to help.

I gave the webinar on the evening of Wednesday at my home in Lexington, Massachusetts. The attendance was dynamic, and peaked somewhere above 300 people. Yujie was a gracious host, but I made rookie mistakes. I scheduled a “Zoom meeting,” instead of “Zoom webinar.” The Zoom meeting made a sound whenever an attendee dropped in or out. During the lecture, an

attendee annotated the shared screen. It took us some time to learn how to clear it up. It could have been worse, according to reported “Zoombombing” incidents. The setting of a Zoom meeting was also ineffective for the after-lecture discussion. Oh, and I forgot to record the webinar.

But I enjoyed the experience. The sheer speed of events intrigued me: only 11 days from an invitation to a seminar to over 300 people! I am a procrastinator but not an atypical one among academics. Could my experience be generalized? Would a webinar on mechanics draw an even larger audience? A thought came to me the next morning. Let’s experiment. Why not set up Professor John Hutchinson to give a webinar? He was my PhD thesis advisor at Harvard in the late 1980s. In February he gave an extremely interesting seminar at Harvard to an audience of about 100 people, a large audience by our local standard. At 9:49 a.m., I sent him an email to ask if he was willing. He did not reply immediately. A second thought came to me. How about starting a webinar series for *Extreme Mechanics Letters* (EML)? EML is an Elsevier journal (launched in 2014), for which Jimmy Hsia (Nanyang Technological University), John Rogers (Northwestern University), and I serve as co-editors-in-chief. I sent them an email at 9:55 a.m. They responded swiftly,

positively, and enthusiastically. By 10:20 a.m., we agreed on the name and time: EML Webinar would run every Wednesday at 7 a.m. in California, 10 a.m. in Boston, 3 p.m. in London, and 10 p.m. in Beijing. We would launch on April 15, with John Hutchinson as the inaugural speaker, if he was willing. He was.

On Friday, April 10, I tweeted an announcement. At the suggestion of Jimmy, Professor Teng Li (University of Maryland), an associate editor of EML, advertised the event on iMechanica.org, an Elsevier website, and the WeChat group “Friends of EML.” Knowing that academics are mostly inactive on social media, EML editors sent emails to our contacts. Some contacts kindly replied that they distributed the announcement through the mailing list of the seminars of their own universities. (Thank you so much.) By then, most universities in the world had shut down. “Professor Hutchinson is a rockstar in mechanics,” I wrote to Mike Rowe, “and we will have more than 500 attendees.” Mike bumped my Zoom account to hold 3,000 people.

On the launch day, April 15, I started the Zoom webinar at 7 a.m., letting people unfamiliar with Zoom run audio-video tests. Hundreds of attendees were online when John Hutchinson signed in at 9:30 a.m. John and I had practiced the setup before, so we had time to kill. I began an impromptu interview with John about his career path to becoming a mechanician.. Teng liked what he saw and hit the button “record to the cloud.” (We had obtained the consent from John for

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recording.) The lecture started at 10 a.m. sharp and finished a little after 11:00 a.m. The total number of participants peaked at about 1,610—equivalent to a plenary at a major conference in mechanics.

What happened after the lecture was fascinating. Several of John's collaborators attended the webinar from all over the world. Teng and I set them up as panelists on the spot. They provided their own perspectives on the joined work. Other attendees "raised hands" by clicking a hand-shaped button on the screen. We set them up as panelists as well. The after-lecture discussion was substantive and wide-ranging, and lasted well over an hour. Participants were free to come and go, but that did not sap the energy of the discussion. "The pre-lecture conversation and the after-lecture discussion had a feel of a Gordon Research Conference," noted John Rogers. The speaker is a researcher of depth, originality, and charisma, the lecture starts from a common background and reaches the frontier of research, and the discussion is substantive. Like a Gordon Research Conference (GRC), we forgo the formality of dressing up, a background logo, and introductory remarks. We devote undivided attention to research and the researcher. This GRC style, noted Steve Cranford, the editor-in-chief of *Matter*, has also emerged organically in other Webinar series, such as the recently held Cell Press Webinars.¹

The entire webinar lasted about 3 hours, resulting in a video of about 1 GB. Teng set up accounts on YouTube and Weibo.² The video of the webinar in its entirety—the pre-lecture conversation, the lecture, and the after-lecture discussion—was uploaded, unedited. The websites now host copies of videos of all EML webinars.

Teng also set up a YouTube live stream, so that the number of attendees can be infinite, no longer limited by my Zoom

account. A viewer has three options: join the Zoom webinar, watch the YouTube live stream, or replay the video. An attendee of a Zoom webinar can participate in discussion. A viewer of a YouTube live stream is anonymous but can also chat with other viewers of the YouTube live stream. A viewer of the replay can choose view time, repeat segments, and speed up. John Rogers was the speaker of the second EML Webinar, and Jimmy Hsia was his discussion leader (Figure 1).³ After a period of questions and answers focused on John's lecture, Jimmy encouraged the attendees to ask broad questions that went beyond John's lecture. In answering these questions, John displayed extraordinary depth of thought and breadth of experience. He made cough sensing fascinating. I replayed the after-lecture discussion several times, and "marked" a few places of interest to me. If many people do the same, scholarly videos will have collective marks.

Attendance of a live webinar does drop after people learn that they can watch replays but is more than compensated by the views of replays. Furthermore, hundreds of live attendees provide enough diversity and energy for a good lecture and substantive after-lecture discussion. The roles of a live webinar and replay are similar to a TV show.

Videos already have two main characteristics of a scholarly publication: accessibility and timestamp. But viewers have no habit of citing videos. Over a long time, many videos will be made but few will be viewed. As scholarly videos proliferate, how will a viewer discover a video, and how will a speaker get credit? This lack of an ecosystem of discovery and credit of videos may as well be a business opportunity, but we already have some solutions, however tentative and imperfect. Twitter and WeChat aggregate like-minded viewers. The number of views listed for a video on YouTube and Weibo gives

satisfaction to the speaker and indicates the popularity of the video to viewers. The speaker can list a webinar in his or her CV adjacent to conference talks.

We may experiment with other mechanisms. We already know a discovery-credit mechanism for scholarly publications. Many papers have been written, but few get read. We—and Google and Baidu and Web of Science—discover papers through citations. We have just started an experiment. Each EML webinar speaker is offered an option to turn the abstract into a short overview (say two pages), published in EML. The main purpose of an EML Webinar Overview is twofold: (1) help readers discover the webinar video and (2) provide a "handle" to cite the speaker. The citations may convert readers of papers to viewers of videos. Through the webinar overviews, the videos may merge into the familiar ecosystem of the discovery and credit of scholarly publications. A video is a publication; we just need to form a habit to cite it.

We suggest to the speaker to keep the written overview simple and in a near-outline form. Let the video speak for details. Because the overview is linked to a webinar, which in turn is linked to published papers, the overview can be speculative or even provocative. In particular, the overview may state untested hypotheses, or even wishful thoughts for future outcomes. The speaker may pick unanswered questions in the after-lecture discussion to recommend future directions of research. An effective overview sparks discussion rather than concludes it.

"How will a scholarly video be peer-reviewed?" Steve Cranford was intrigued. It will make sense to peer-review a video when the speaker can readily edit the video. We have a long way to go. Who will cite an EML Webinar



Figure 1. John Rogers (Speaker) and Jimmy Hsia (Discussion Leader), along with Impromptu Panelists Drafted to the Screen

Overview? Perhaps the speaker will cite his or her own webinar overview as a concise statement of a body of work. At this writing, two EML Webinar Overviews have been published.^{4,5} Here we go—I have just cited the two speakers, and you have just discovered two extraordinary videos. To complete the ecosystem, you will have to watch the videos and cite the overviews. In doing so, you credit the speakers and help other viewers to discover the videos.

It makes no sense for an author to publish the same paper more than once. It also makes no sense for a speaker to give the same webinar more than once, if the webinar videos are generally accessible. I have several favorite talks, which I have been giving repeatedly over the years. The practice is acceptable because each seminar has a distinct audience. But I will be careful to publish a webinar, because the audi-

ence of a webinar will always be the same: everyone in the world, forever. I will have to make each webinar distinct. It gives me enormous pleasure that my second webinar—an iCanX Talk—was recorded to the cloud.⁶

It takes a community to sustain a webinar series. EML Webinar aims to be a meeting place for mechanics and their friends, worldwide. So much interesting and important research is going on in mechanics, as well as at the interfaces between mechanics and other disciplines, such as medicine, chemistry, robotics, biometric sensing, materials science, and computer science. At the rate of one speaker per week, it will take some time to cover even a portion of this excitement. But after some time, a year or two, we will have videos on diverse topics by diverse speakers. EML and EML Webinar have to achieve a particular balancing act:

stand for extreme mechanics, but not fringe mechanics, not popular mechanics. We seek to publish research of immediacy, depth, and originality.

Teng and I co-founded iMechanica.org in 2006, when Web 2.0 swept the land.⁷ Back then, young people were discovering Facebook, but academic communication was stuck to papers, lectures, emails, and conversations. iMechanica helps to open another channel of academic communication: blog posts. Web 2.0 has enabled a change: many academics no longer just read online but also write online.

A new change has just started—or has just forced upon us: many academics will no longer just view videos but will also produce videos. Will webinars replace seminars? Partly, perhaps. A seminar is more than a lecture and after-lecture discussion. The speaker

typically spends some time with individuals in the host institution. Webinars will substitute some functions of seminars and conferences but not all.⁸

An early highlight of iMechanica came when I bribed my 13-year-old son, Michael, to post an entry, which sparked a thread of discussion between him, me, and my graduate students on the technology of e-readers.⁹ After a review of the technology, Michael wrote, "However, the written word is definitely not the ultimate form of knowledge distribution or even of communication. It's just the best we've come up with so far. Imagine. If some omnipotent being wanted to tell someone to build, say, an ark, would this god write down a note and send it to him? Of course not. The god would probably send it to the mortal in the form of a dream, along with all the necessary sensations and thoughts to ensure perfect understanding. Indeed, a dream (or something which simulates thoughts and senses) would be the ideal form of communication."

Technology determines how people communicate. Academics tend to adopt new technology slowly, behind the general public. Writing and reading are extraordinarily unnatural and take an enormous amount of time to learn. Would writing and reading be invented if Zoom existed at the dawn of civilization? We will never know. We do know that scholarly journals arrived long after

printing was invented.¹⁰ We also know that scholarly videos arrived long after movies and televisions were invented. In the 1960s, the National Science Foundation sponsored a set of films on fluid mechanics, and BBC produced the films of Feynman's lectures on the characters of physical laws. These films cost a considerably amount to make and became readily accessible only after YouTube was invented. Today, anyone can make a video by a single click and, if desired, the same click sends the video to the cloud, for everyone to view, forever. I have several printed versions of Newton's Principia but have never managed to read beyond the first few lines. I wish to watch Newton give a webinar. To read is human, to watch divine.

The engineering of EML Webinar may help people think about starting their own webinar series. The barrier to entry is low. The world has just discovered a new resource of enormous abundance: Zoom-ready people. But we will always be limited by a fundamental scarcity: attention of people. A new division of labor will emerge as the economics of communication changes. We are still in early days in watching this change play out. Let us engineer the future of discovery.

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1. Cell Press Webinars. <https://www.cell.com/webinars>.
2. EML Webinar YouTube and Weibo Channels. <https://www.youtube.com/channel/UCfMWBNGZ1gP5eSjmyNSFvWA/videos>. <https://m.weibo.cn/u/7438669989>.
3. Rogers, J.A. (2020). Enabling ideas in the mechanics of bio-integrated electronic systems – from COVID-19 patients to engineered mini-brains. EML Webinar. <https://www.youtube.com/watch?v=s61jkLH70Xk>.
4. Zhao, X.H. (2020). EML webinar overview: extreme mechanics of soft materials for merging human-machine intelligence. *Extreme Mech. Lett.* 39, 100784.
5. Hutchinson, J.W. (2020). EML webinar overview: new development in shell stability. *Extreme Mech. Lett.* 39, 100805.
6. Suo, Z.G. (2020). Ions, electrons, and innotronics (iCanX Talk). <https://youtu.be/id6WbK9GYXY>. https://talks.ican-x.com/detail/v_5ec014f9b2f90_cxDpcOy2/3.
7. Li, T. (2019). iMechanica.org: engineering research and education in the Internet Era. <https://youtu.be/Y6PqzGr2XH4>.
8. Reshef, O., Aharonovich, I., Armani, A.M., Gigan, S., Grange, R., Kats, M.A., and Sapienza, R. (2020). How to organize an online conference. *Nat. Rev. Mater.* 5, 1–4.
9. Suo, M.H. (2006). The future of ink. <https://imechanica.org/node/311>.
10. Nielsen, M. (2011). *Reinventing Discovery* (Princeton University Press).