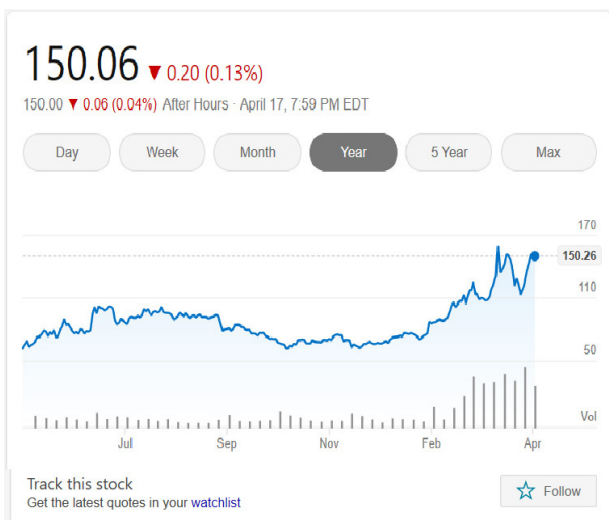


THE VORTEX

AMERICAN CHEMICAL SOCIETY
VOLUME LXXXII NUMBER 5

CALIFORNIA SECTION
May 2020



Stock price for the company Zoom, see Chair's message page 3

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Lloyd Ryland Outstanding
High School Chemistry Teacher Award

The Section is pleased to announce the selection of Jonathan Holcomb of San Lorenzo as the recipient of the Lloyd Ryland Outstanding High School Chemistry Teacher Award. He was nominated by the retired Science Coordinator for San Lorenzo with a supporting letter from his principal. His nomination is impressive – he expanded the chemistry program from being limited to gifted students such that chemistry is now a required course for all students, he has been recommended by the California State Teachers Association, he has helped the school district adopt the Next Generation Science Standards, and his students performed well on the AP chemistry test. The award comes with a check to him for \$500, a check for \$500 to the chemistry department, and a membership in AACT.

The award is named after Mr. Lloyd Ryland, a member of the California Section of the American Chemical Society for 65 years and a strong believer in chemistry education. He was born in San Francisco in 1912 and lived his entire life in the Bay Area. Mr. Ryland received his bachelors degree from U.C. Berkeley and was employed by Chevron Development Company for 65 years as a chemist. During World War II he joined the U.S. Coast Guard Auxiliary and after the war became a member and officer of three Yacht Clubs. Mr. Ryland made a generous contribution to the Section and we are pleased to honor him by naming this award after him.

Purpose: To recognize, encourage, and stimulate outstanding teachers of high school chemistry in the California Section

of the American Chemical Society.

The Ryland Award consists of a cash award of \$500 to the teacher, \$500 to the teacher's high school chemistry department, and a certificate.

Previous recipients of the award

- 2019 Brian Hopper, Hoopa Valley High School (Humboldt County)
- 2018 Alex Lee (Irvington High School, Fremont) and Paul Matsumoto (Galileo Academy of Science and Technology, San Francisco)
- 2017 Robert Fabini (El Cerrito High School, El Cerrito)
- 2016 Evy Kavalier (Berkeley High School, Berkeley)
- 2015 Julie Hubbard (Liberty High School, Brentwood)
- 2014 Michelle Wynn (St. Ignatius College Preparatory, San Francisco)
- 2013 Sai Kumar (San Jose High School, Fremont)
- 2012 Heather Pereira (Amador Valley High School, Pleasanton)
- 2011 Beth Cutter (Amador Valley High School, Pleasanton)
- 2010 Jenelle Ball (Chico High School, Chico)
- 2010 Lee Boyes (Petaluma High School, Petaluma)
- 2009 Paula Simms (Amador Valley High School, Pleasanton)
- 2008 Tracy Ostrom (Skyline High School, Oakland)

Eileen Nottoli, Section Chair, High School Teacher Committee



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Chair's Message

Jim Postma

This is the era of Zoom meetings. On the front page you can see the trend in Zoom's stock price for the last five months and if you've been participating in the ACS locally or nationally, it's not hard to know why Zoom has been so successful; I have at least six Zoom meetings a week and next week I'm scheduled for thirteen of them. Zoom is a tremendously useful tool and even more so in this "social distancing" context. The Section Executive Committee used it last week to hold our monthly meeting and things went remarkably smoothly I thought. Our Section has a couple of plans involving Zoom that might be of interest to our members:

We're working on a Zoom training seminar (or seminars, depending on demand.) One of the best features of Zoom is how easy it is to use at a basic level. You can call in to a meeting with just your phone and not deal with a computer or smartphone at

all; in that mode you don't even need to get dressed. With only a little extra effort you can join a meeting with your face and your voice and participate with discussion, voting, and even the ability to raise your hand for recognition. Alex Madonik and some of his colleagues for the College of Alameda are working on a plan. Thanks to Lou Rigali for the idea. Watch your email for instructions on when, where (your house) and how to prepare for basic training.

Alicia Taylor and Patrick Lee are working to adapt our Section Meetings to a Zoom format. Zoom has features that duplicate most of the components of a presentation, including showing slides, back-and-forth discussion, and even subset small group discussions. But it takes a lot of pre-planning to present a quality program and, as you probably have experienced, the technology can fail in a variety of ways at any time. Watch for the results of this experiment.

I'm looking forward to a normal California Section (if there is such a thing.)

Jim



Associate Editor(s) Wanted for the Vortex (Volunteer)

The Vortex is looking for someone who likes to read and write and provide original articles and summaries of technical articles for publishing in the Vortex. No office hours, no deadlines.

*The Infection That's Silently Killing Coronavirus Patients
This is what I learned during
10 days of treating Covid pneumonia at Bellevue Hospital.*

By Richard Levitan, Sunday Review, Online, April 20 2020

I have been practicing emergency medicine for 30 years. In 1994 I invented an imaging system for teaching intubation, the procedure of inserting breathing tubes. This led me to perform research into this procedure, and subsequently teach airway procedure courses to physicians worldwide for the last two decades.

So at the end of March, as a crush of Covid-19 patients began overwhelming hospitals in New York City, I volunteered to spend 10 days at Bellevue, helping at the hospital where I trained. Over those days, I realized that we are not detecting the deadly pneumonia the virus causes early enough and that we could be doing more to keep patients off ventilators — and alive.

On the long drive to New York from my home in New Hampshire, I called my friend Nick Caputo, an emergency physician in the Bronx, who was already in the thick of it. I wanted to know what I was facing, how to stay safe and what his insights into airway management with this disease were. “Rich,” he said, “it’s like nothing I’ve ever seen before.”

He was right. Pneumonia caused by the coronavirus has had a stunning impact on the city’s hospital system. Normally an E.R. has a mix of patients with conditions ranging from the serious, such as heart attacks, strokes and traumatic injuries, to the non-life-threatening, such as minor lacerations, intoxication, orthopedic injuries and migraine headaches.

During my recent time at Bellevue, though, almost all the E.R. patients had Covid pneumonia. Within the first hour of my first shift I inserted breathing tubes into two patients.

Even patients without respiratory complaints had Covid pneumonia. The patient stabbed in the shoulder, whom we X-rayed because we worried he had a collapsed

lung, actually had Covid pneumonia. In patients on whom we did CT scans because they were injured in falls, we coincidentally found Covid pneumonia. Elderly patients who had passed out for unknown reasons and a number of diabetic patients were found to have it.

And here is what really surprised us: These patients did not report any sensation. We are just beginning to recognize that Covid pneumonia initially causes a form of oxygen deprivation we call “silent hypoxia” — “silent” because of its insidious, hard-to-detect nature.

To my amazement, most patients I saw said they had been sick for a week or so with fever, cough, upset stomach and fatigue, but they only became short of breath the day they came to the hospital. Their pneumonia had clearly been going on for days, but by the time they felt they had to go to the hospital, they were often already in critical condition.

In emergency departments we insert breathing tubes in critically ill patients for a variety of reasons. In my 30 years of practice, however, most patients requiring emergency intubation are in shock, have altered mental status or are grunting to breathe. Patients requiring intubation because of acute hypoxia are often unconscious or using every muscle they can to take a breath. They are in extreme duress. Covid pneumonia cases are very different.

A vast majority of Covid pneumonia patients I met had remarkably low oxygen saturations at triage — seemingly incompatible with life — but they were using their cellphones as we put them on monitors. Although breathing fast, they had relatively minimal apparent distress, despite dangerously low oxygen levels and terrible pneumonia on chest X-rays.

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Volcanic Violence – Revisited

Bill Motzer

We humans have the capacity to remember past events, particularly if those events have had significant impacts on our lives. For those of us having lived through human-caused and natural historical events (e.g., the first Lunar



landing, the Challenger disaster, 9/11, the Loma Prieta earthquake, etc.) there's a tendency to recall where you were and what you were doing when that event took place. (Whether or not we'll recall the current coronavirus pandemic, particularly if we and our families survive unscathed, is currently being argued by cognitive psychologists.) One event that impacted my life and memory occurred 40 years ago. This anniversary will be on Monday, May 18th—the eruption of Mount Saint Helens in Washington State—the only volcanic eruptive episode that I've experienced on a scientific and personal level. I described this event in detail in the May 2013 Vortex and in subsequent articles about volcanic geochemistry in the May 2014, June 2015, and May 2016 issues.

Fifty-seven people lost their lives during the Mount Saint Helens eruption, including U.S. Geological Survey (USGS) volcanologist David A. Johnston and my friend and graduate school colleague Jim Fitzgerald; both were monitoring ongoing volcanic activity. Although considered to be a relatively modest eruption, it released energy equivalent to a 24-megaton explosion, devastated forests, obliterated wildlife (~7,000 large game animals) over 600 km² area, causing more than \$1 billion 1980 dollars (\$3.4 billion in 2019) in damages to the local economy, agriculture, businesses, and structures and during nine hours of continuous eruption about 540 million metric tons (t) of ash fell over an area exceeding 57,000 km².

As natural disasters go (hurricanes, tornadoes, earthquakes, and tsunamis), the Mount Saint Helens eruption does not seem to have been a significant event. However,



from 2004 to 2008, the volcano continued with sustained eruptive activity that created a lava dome in the volcano's crater, which occasionally sent ash into the atmosphere. Therefore, future eruptions may occur from Mount Saint Helens and other volcanoes in the Cascade Ranges of California, Oregon and Washington that have the capability of such explosive eruptions.

In the 40 years since U.S. agencies have coordinated to keep a major western North America eruption, where most U.S. volcanic activity occurs, from becoming a major disaster and health crisis, extensive plans were implemented in 2011; however, disaster experts have found that it's now long past time for a more modern plan, and these are in progress. What has been accomplished in the last four decades is more extensive regional and local volcanic monitoring from ground, airborne, and satellite observations such as seismic detectors (upward moving magma causes numerous small earthquakes), GPS detectors, tiltmeters, and InSAR (Interferometric Synthetic Aperture Radar) that monitors elevation and stress/strain changes (upward moving magma expands and contracts ground surfaces), and infrared detection from ground and satellite bases (as the magma heats surrounding rocks near the surface

But what about chemical monitoring? Active volcanoes emit gases that vary depending on their melted rock (magma) type and volcanic activity; e.g., water vapor

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may range from 50 to 90% by volume, CO₂ from 1.0 to 40%, SO₂ from 1.0 to 25%, H₂S from 1.0 to 10%, and HCl from 1.0 to 10%. Additional detected gases, mostly in trace amounts, include carbon disulfide (CS₂), carbonyl sulfide (COS), and hydrogen sulfide (H₂S). In some active volcanoes, CO₂ and SO₂ are known to significantly increase prior to an eruption. Newly developed solar powered CO₂ sensor stations can continuously acquire CO₂ concentrations flowing from the ground. For these instruments, CO₂ detection ranges from 1.0 to 3,000 ppm and 0 to 10% are possible, with accompanying temperature and atmospheric measurements provided by continuous data transmission.

These gases, particularly SO₂ allowed volcanologists with the Philippine Institute of Volcanology and Seismology, assisted by the USGS, to successfully predict the major 1991 Mount Pinatubo eruption event. In May, SO₂ emission measurements indicated a rapid increase from 500 metric tons per day (t/day) to 5,000 t/day indicating a rising column of fresh magma below the volcano. However, after these increases there was a sudden rapid decrease in SO₂ emissions indicating that the degassing magma was being blocked causing substantial pressure increases in the magma chamber. This would result in violent volcanic explosions and these occurred from June 12 through June 15. But based on the geochemical and other data, the intervening time allowed major evacuations around the volcano prior to the catastrophic pyroclastic ash flow.

Olympiad

This year's Chemistry Olympiad has been impacted by Covid-19. While we were able to have the local exam administered to 121 students from 23 high schools, ACS moved to an online test for Part 1 of the national test on April 26 with little time to prepare. The top 150 students nationwide will be invited to take Part 2 on May 3; it is not clear if there will be an international competition but if so, it will be a virtual competition as will any Study Camp.

Of the 23 participating high schools in the local exam, we were encouraged that three were from outside the Bay Area. We will consider having a travel grant for students outside the Bay Area in future years. We gave the nine teachers who generally participate in the Olympiad a choice of an Olympiad tee-shirt or a one year membership in AACT. We had 19 students who qualified to take the National exam. In light of the uncertainty of whether there would be a national exam, we opted to give each student an Olympiad tee-shirt as well as an Olympiad pin and Sebergium pin. Every teacher who participated in the local exam and the students who qualified to take the National exam received a personal letter of thanks. We also gave the top two students in the local exam a check for \$100. We will give cash awards of \$125 for any student being selected to Study Camp (top 20 students), \$100 for making High Honors (top 31-50 students), and \$75 for making Honors (top 51-200) in the National exam.

Eileen Nottoli, Section Chair, High School Teacher Committee



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Report from ACS Governance – In Lieu of Spring ACS National Meeting Report

By now all of our California Local Section members should be well aware that the Spring National ACS meeting, that was scheduled for Philadelphia in March, was cancelled due to the coronavirus pandemic – an action without precedent, but unfortunately warranted under the circumstances. Your primary author was especially aggrieved by this action as he is originally from Philadelphia and was looking forward to getting his “fix” of cheesesteaks and Philly pretzels. We did miss a mix of both warm and chilly weather, however.

Even with the National meeting itself being cancelled, there are governance functions that are required to take place in the spring and many of the Board and Council committees met in virtual sessions in the March-April timeframe, including a virtual full Council meeting on April 20th for the sole purpose of holding a Town Hall meeting for presentations by the four candidates for 2021 President-Elect of the ACS followed by voting the week of April 27th to narrow the field to the final two nominees that will appear on the ballot this fall. The ACS Council Policy Committee, which has the authority to meet and decide on Council related issues in the absence of the full Council, met several times in virtual Executive session. Other than making the decision to hold the Town Hall Meeting mentioned above, the proposal from Budget and Finance to hold the 2021 ACS dues at the \$175 level of 2020, instead of following the normal calculation that would have set the dues at \$180 for 2021, was accepted. In addition, the petition from the Membership Affairs committee (MAC) to consolidate the ACS dues categories into a Schedule separate from the Bylaws and Standing Rules in order to facilitate marketing experiments aimed at increasing and/or maintaining ACS membership levels was also passed.

It is a tradition that CALACS Councilors choose to be assigned and active on ACS Council committees if possible. In addition

to our eight Councilors, we also now have two CALACS members on the ACS Board of Directors and two members who are ACS Past Presidents and continue to be active. Comments on the activities of those members whose committees met in virtual session, or who obtained information by other means are given below:

Bryan Balazs – ACS Board of Directors, Elected 2020 Vice Chair, Budget and Finance Committee (B&F) Chair, Board of Trustees – ACS Member Insurance Program. The ACS is in strong financial shape going into 2020, which is fortunate due to the expected financial issues expected to be caused by the cancellation of the Spring National Meeting and other issues that might arise through the year. B&F has established a new sub-committee to oversee the restructuring of program funding requests and program review functions – named “Portfolio Evaluation and Optimization,” giving ACS a new acronym, PEVOP

Jenelle Ball – New Councilor in 2020 – not yet assigned to a committee

Michael Cheng – Project SEED (comments along with Elaine Yamaguchi – CALACS SEED coordinator) While the committee received 437 SEED I and 136 SEED 2 proposals and approved 380 SEED I and 122 SEED 2 due to budget constraints, along with 14 first time mentoring sites, it is very likely that the 2020 summer SEED program will be cancelled due to the coronavirus pandemic that has closed most mentoring sites and put restrictions on mentors.

Mark Frishberg – Council Policy Committee (CPC), and member of its Long Range Planning and its Petitions and Bylaws subcommittees, and ACS Career Consultant and Workshop Presenter CPC - In addition to the CPC items noted above, the Long Range Planning subcommittee presented a New Councilor and Alternate Councilor Orientation webinar in February, and another virtual session introduc-

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ing ACS elective positions and a review of ACS Council committees on April 14th in lieu of the Orientation Program and Reception for that same group that had been planned for the Spring National meeting. ACS Career Consultants – efforts are in progress for offering individual virtual career counseling sessions between now and the August National meeting as a replacement for having to cancel the Career Fair in Philadelphia. Career consultants had the opportunity to learn more about using LinkedIn for personal branding and job searching in two webinars in April.

Sheila Kanodia – Committee on Ethics

Lee Latimer – ACS Board of Directors

Reported that the Board is working to minimize the effect of the coronavirus pandemic on ACS affairs.

Patrick Lee – New Councilor in 2020 – not yet assigned to a committee

Alex Madonik – Committee on Community Affairs (CCA) met via Zoom conferencing. Chemists Celebrate Earth Week (CCEW) with its theme, “Protecting Our

Planet Through Chemistry,” is going to be restricted to virtual events.

National Chemistry Week (NCW) 2020 will have the theme “Sticking with Chemistry – Chemistry of Adhesives.”

Eileen Nottoli – Local Section Activities Committee (LSAC)

Attila Pavlath – ACS Past-President, International Activities Committee (IAC)

James Postma – New Councilor in 2019 – not yet assigned to a committee

Marinda Wu – ACS Past President, ACS Career Consultant and Workshop Presenter. Attended the webinars on Trends in Recruitment and Effective Job Strategies in 2020 utilizing LinkedIn. Attending virtual training for ACS Career Consultants on using ZOOM and new virtual ACS career services, virtual office hours for career consulting, and webinars with career tips during this COVID-19 pandemic.

Submitted by ACS Councilor, Mark Frishberg, with input from other CALACS Councilors, members of the ACS Board of Directors, and ACS Past-Presidents– April 18, 2020



SARS-CoV-2 could have been created through laboratory manipulation

Michael Antoniou, letter to the Editor of Nature Medicine, Published by GMWatch, on-line April 22, 2020.

Kristian Andersen and colleagues (“The proximal origin of SARS-CoV-2”, 26: 450–452, 2020) argue that their amino acid sequence comparisons and computational modelling definitively proves that SARS-CoV-2 has arisen through natural mutation and selection in animal or human hosts, and not through laboratory manipulation and accidental release. However, although the authors may indeed be correct in how they perceive SARS-CoV-2 to have arisen, the data they present does not exclude the possibility that this new coronavirus variant could have been created through an *in vitro*, directed iterative evolutionary selection process (see https://en.wikipedia.org/wiki/Directed_evolution). Using this method, a very large library of randomly mutagenized coronavirus spike proteins could be selected for strong binding to the ACE2 receptor and consequently high infectivity of human cells. The power of such directed evolution to select for optimal enzymatic and protein-protein interactions was acknowledged by the award of the Nobel Prize in Chemistry in 2018 (see <https://www.nobelprize.org/prizes/chemistry/2018/summary/>).

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We are only just beginning to understand why this is so. The coronavirus attacks lung cells that make surfactant. This substance helps the air sacs in the lungs stay open between breaths and is critical to normal lung function. As the inflammation from Covid pneumonia starts, it causes the air sacs to collapse, and oxygen levels fall. Yet the lungs initially remain “compliant,” not yet stiff or heavy with fluid. This means patients can still expel carbon dioxide — and without a buildup of carbon dioxide, patients do not feel short of breath.

Patients compensate for the low oxygen in their blood by breathing faster and deeper — and this happens without their realizing it. This silent hypoxia, and the patient’s physiological response to it, causes even more inflammation and more air sacs to collapse, and the pneumonia worsens until oxygen levels plummet. In effect, patients are injuring their own lungs by breathing harder and harder. Twenty percent of Covid pneumonia patients then go on to a second and deadlier phase of lung injury. Fluid builds up and the lungs become stiff, carbon dioxide rises, and patients develop acute respiratory failure.

By the time patients have noticeable trouble breathing and present to the hospital with dangerously low oxygen levels, many will ultimately require a ventilator.

Silent hypoxia progressing rapidly to respiratory failure explains cases of Covid-19 patients dying suddenly after not feeling short of breath. (It appears that most Covid-19 patients experience relatively mild symptoms and get over the illness in a week or two without treatment.)

A major reason this pandemic is straining our health system is the alarming severity of lung injury patients have when they arrive in emergency rooms. Covid-19 overwhelmingly kills through the lungs. And because so many patients are not going to the hospital until their pneumonia is already well advanced, many wind up on ventilators, causing shortages of the machines. And once on ventilators, many die.

Avoiding the use of a ventilator is a huge

win for both patient and the health care system. The resources needed for patients on ventilators are staggering. Vented patients require multiple sedatives so that they don’t buck the vent or accidentally remove their breathing tubes; they need intravenous and arterial lines, IV medicines and IV pumps. In addition to a tube in the trachea, they have tubes in their stomach and bladder. Teams of people are required to move each patient, turning them on their stomach and then their back, twice a day to improve lung function.

There is a way we could identify more patients who have Covid pneumonia sooner and treat them more effectively — and it would not require waiting for a coronavirus test at a hospital or doctor’s office. It requires detecting silent hypoxia early through a common medical device that can be purchased without a prescription at most pharmacies: a pulse oximeter.

Pulse oximetry is no more complicated than using a thermometer. These small devices turn on with one button and are placed on a fingertip. In a few seconds, two numbers are displayed: oxygen saturation and pulse rate. Pulse oximeters are extremely reliable in detecting oxygenation problems and elevated heart rates.

Pulse oximeters helped save the lives of two emergency physicians I know, alerting them early on to the need for treatment. When they noticed their oxygen levels declining, both went to the hospital and recovered (though one waited longer and required more treatment). Detection of hypoxia, early treatment and close monitoring apparently also worked for Boris Johnson, the British prime minister.

Widespread pulse oximetry screening for Covid pneumonia — whether people check themselves on home devices or go to clinics or doctors’ offices — could provide an early warning system for the kinds of breathing problems associated with Covid pneumonia.

People using the devices at home would want to consult with their doctors to reduce the number of people who come to the E.R. unnecessarily because they misinterpret

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their device. There also may be some patients who have unrecognized chronic lung problems and have borderline or slightly low oxygen saturations unrelated to Covid-19.

All patients who have tested positive for the coronavirus should have pulse oximetry monitoring for two weeks, the period during which Covid pneumonia typically develops. All persons with cough, fatigue and fevers should also have pulse oximeter monitoring even if they have not had virus testing, or even if their swab test was negative, because those tests are only about 70 percent accurate. A vast majority of Americans who have been exposed to the virus don't know it.

There are other things we can do as well to avoid immediately resorting to intubation and a ventilator. Patient positioning maneuvers (having patients lie on their stomach and sides) open up the lower and posterior lungs most affected in Covid pneumonia. Oxygenation and positioning helped patients breathe easier and seemed to prevent progression of the disease in many cases. In a preliminary study by Dr. Caputo, this strategy helped keep three out of four patients with advanced Covid pneumonia from needing a ventilator in

the first 24 hours.

To date, Covid-19 has killed more than 40,600 people nationwide — more than 10,000 in New York State alone. Oximeters are not 100 percent accurate, and they are not a panacea. There will be deaths and bad outcomes that are not preventable. We don't fully understand why certain patients get so sick, or why some go on to develop multi-organ failure. Many elderly people, already weak with chronic illness, and those with underlying lung disease do very poorly with Covid pneumonia, despite aggressive treatment.

But we can do better. Right now, many emergency rooms are either being crushed by this one disease or waiting for it to hit. We must direct resources to identifying and treating the initial phase of Covid pneumonia earlier by screening for silent hypoxia.

It's time to get ahead of this virus instead of chasing it.

Richard Levitan, an emergency physician in Littleton, N.H., is president of Airway Cam Technologies, a company that teaches courses in intubation and airway management.

A version of this article appears in print on April 26, 2020, Section SR, Page 3 of the New York edition with the headline: How We Can Get Ahead of Covid-19.





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