



**Australian Friends  
of The Hebrew  
University**

Our passion for  
progress

**Year Book  
2021/22**



*Artists  
Impression  
Of The New  
Centre For  
Computational  
Medicine*

**Australian Friends of  
The Hebrew University of Jerusalem**



## Australian Friends of The Hebrew University

Our passion for  
progress

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are of a decisive  
importance."*

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- a founding father of  
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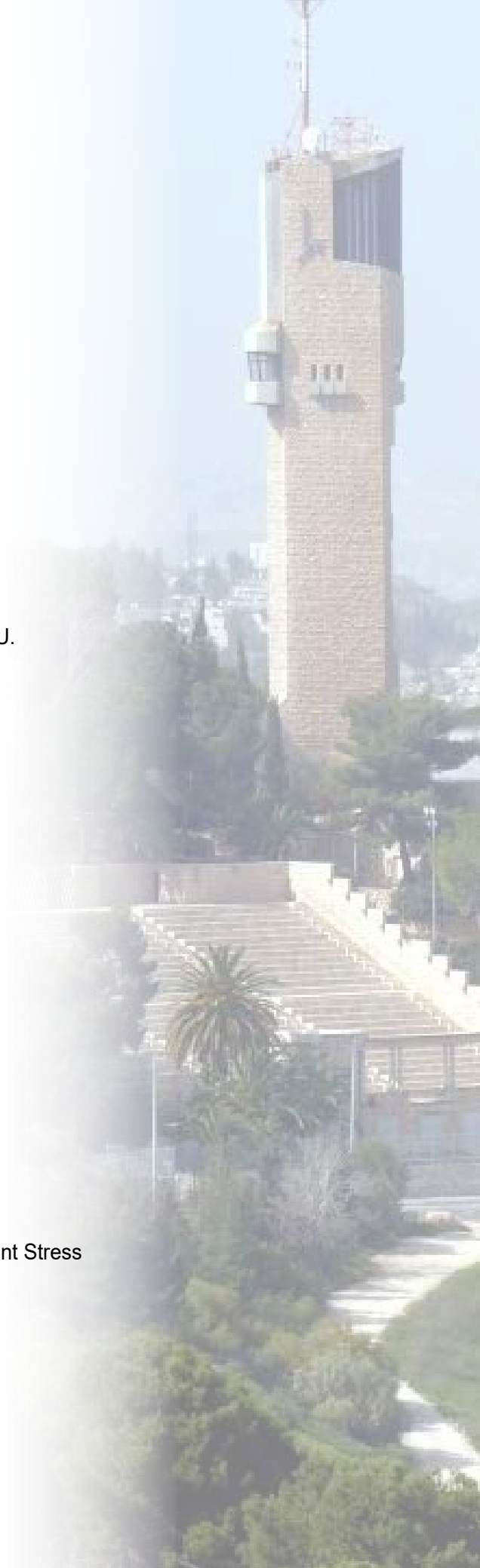
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# YEAR BOOK 2021-22

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## Message from the CEO

*Dear Friends*

*Once again, we are delighted to bring you our Yearbook in both an electronic version and for those that still like to 'hold a copy in their hands' we have a limited number of hard copies available from our office.*

*In my Yearbook message last year, I expressed the hope “....that by the time the 2021 Yearbook reaches you, that the world will have started to recover from one of the worst pandemics in history.”*

*Well, this pandemic has lasted for more than two years but thankfully, the latest – and hopefully the last – variant does not seem to be as severe as previous variants and slowly, the world has begun to accept that we need to learn to live with covid and start resuming a normal life.*

*Our Yearbook features some of the amazing work and activities that took place both in Israel and here in Australia. Despite the challenges posed by covid, the Hebrew University continued to be “a shining light unto the nations” and we, as the Australian Friends are proud to represent Israel's and indeed one of the world's premier institutions of higher learning here “Downunder.”*

*In the spirit of normalization, the 2022 Hebrew University Board of Governors is, while you are reading our Yearbook, hopefully taking place physically in Jerusalem for the first time since 2019. During the last two years, most of our meetings have been “virtual” and in the case of international meetings, have largely taken place at unearthly hours in terms of Australia. Nevertheless, Zoom meetings have very much become a fact of life and for international meetings that can't take place physically, this has been a wonderful way of interacting with colleagues in Jerusalem and indeed around the world.*

*Whilst writing about interacting with I would also like to welcome new staff members who have joined us in the past year; in particular Michelle Gold and Eric Berman – more details about them and existing staff members are mentioned on page 24. A thank you to Shira Halberstadt for the design of our Yearbook and to Philip Joel of Kwik Kopy who always goes the extra mile for us.*

*We would not be able to produce this Yearbook without the support of our advertisers many of whom have advertised with us for more than 20 years so a very big thank you for your continued support.*

*Finally, to our members, donors and supporters throughout Australia, we are most appreciative of your friendship and donations to medical research through Hebrew U Health Promotions or for student support for Australian students wishing to study at the Hebrew University through our scholarship fund both of which entities offer Australian donors tax deductibility.*

*We hope you will enjoy our 2022 Yearbook and that with your support, we will ensure that the Hebrew University continues as Israel's pre-eminent university top ranked international university!*

*Thank you for your continuing support and friendship.*

*Wishing you good health*



ROBERT SCHNEIDER  
Chief Executive Officer

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## Australian Governors of the Hebrew University of Jerusalem

Mr Michael Dunkel	Governor	Mr Philip Moses	Governor
Mr Stuart Silbert OAM	Governor	Assoc Prof Peter Winterton AM	Governor
Mr Robert Simons OAM	Governor	Mrs Agnes Ginges	Honorary Governor
Mr Sam Lipski AM	Governor	Professor Leon Mann AO	Honorary Governor
Mr Jerremy Leibler	Governor	Mr Harry Triguboff AO	Honorary Governor
Mr Barry Joseph	Governor		

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## Australian Recipients of Honorary Doctorates of the Hebrew University of Jerusalem

Mr Marc Besen AO	(VIC)
Mr Michael Dunkel	(NSW)
Mrs Agnes Ginges	(NSW)
Mr Harry Hoffman AM	(WA)
Mr John Howard AC	(NSW)
Mr Stuart Silbert OAM	(WA)
Mr Robert Simons OAM	(NSW)
Mr Harry Triguboff AO	(NSW)
Mr Israel Blankfield *	(VIC)
Mr Ron Castan AM QC *	(VIC)
Sir Zelman Cowen AK *	(VIC)
Mr Berel Ginges *	(NSW)
Mr John Hammond *	(NSW)
Mr Robert J Hawke AC *	(VIC)
Dr Henry Krongold AM *	(VIC)
Mr Isador Magid AM *	(VIC)
Mr Richard Pratt *	(VIC)

\* (Deceased)

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## Australian Recipients of Honorary Fellowships of the Hebrew University of Jerusalem

Mr Michael Dunkel	(NSW)
Mrs Shirley Ehrlich	(NSW)
Mr Harry Hoffman AM	(WA)
Mrs Sylvia Hoffman	(WA)
Mr Leon Kempner OAM	(VIC)
Mr Barry Joseph	(NSW)
Professor Leon Mann AO	(VIC)
Mr Robert McGarvie AC QC	(VIC)
Mr Philip Moses	(NSW)
Mr Wolfie Pizem OAM	(NSW)
Mr Stuart Silbert OAM	(WA)
Mr Robert Simons OAM	(NSW)
Mrs Basil Starr	(VIC)
Mr Israel Blankfield *	(VIC)
Mr Ron Castan AM QC *	(VIC)
Mr Alroy Cohen *	(NSW)
Mr Maurice Cohen OBE *	(VIC)
Mrs Felicia Einhorn *	(NSW)
Mr Stefan Einhorn OAM *	(NSW)
Mr Joseph Frank *	(NSW)
Mr Max Freilich OBE *	(NSW)
Mr Berel Ginges *	(NSW)
Mrs Nerida Goodman MBE *	(NSW)
Mr John Hammond *	(NSW)
Mr Robert J Hawke AC *	(VIC)
Mr A D Hallam *	(VIC)
Dr Jack Hoffman OAM *	(WA)
Mr Alan K Milston OAM *	(NSW)
Professor Louis Waller AO *	(VIC)

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## Australian Friends of the Hebrew University of Jerusalem

President:	Mr Michael Dunkel	National Office
Vice Presidents:	Mr Philip Moses	P O Box 876
	Mr Paul Fine	Bondi Junction NSW 1355
Hon. Treasurer	Mr Robert Greenfield	Tel.: (02) 9389 2825
Hon. Secretary	Mr Barry Joseph	Fax: 02 9387 5584
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WA State President:	Ass. Prof. Peter Winterton AM	Website: <a href="http://www.austfhu.org.au">www.austfhu.org.au</a>
Hon. Chairman:	Mr Robert Simons OAM	
Chief Executive:	Mr Robert Schneider	

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The Hebrew University of Jerusalem, Israel's first university, is a multidisciplinary institution of higher learning and research where intellectual pioneering, cutting-edge discovery, and a passion for learning flourish. It is a center of international repute, with ties extending to the worldwide scientific and academic community, where teaching and research drive innovation and provide the broadest of education for its students.

Ranked among the world's leading universities, the Hebrew University is an institution where excellence is emphasized; where advanced, postgraduate study and research are encouraged; and where special programs and conferences attract students and academics from around the world. At its core, the Hebrew University's mission is to develop cutting-edge research, to educate future leaders, and to nurture generations of outstanding scientists and scholars in all fields of learning.

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**Director, Division for Advancement & External Relations**  
Ram Semo

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## From the Australian Friends Federal President

Michael Dunkel

(Note this Report relates to the year- end 30 June 2021)

This year, as the last, has been very challenging for us all, given the continuing presence of, and ongoing battle against Covid-19.

Lengthy lockdowns in Sydney and Melbourne, border closures between States and Territories in Australia and the consequent interruptions to business and, indeed, to normal life has impacted all of us and has wreaked havoc in the not-for-profit sector in particular.

Normal meetings and functions could not be held, people could not meet and mingle and all events could only be held virtually by electronic means such as Zoom.

All these challenges were not confined to Australia by any means. Although Israel has been at the forefront of the battle against the Coronavirus, particularly with its program of early vaccinations, its population and its institutions were also greatly affected, and consequently the Hebrew University was forced to hold Executive Committee and Board of Governors meetings by Zoom in both 2020 and in 2021.

The University's research activities, as well as teaching, continued apace throughout the pandemic period, albeit in a suitably varied form to suit the circumstances. Much was achieved, both in research related to the challenges of the

Coronavirus, as well as in other research not directly related to the Coronavirus. The results of this research have been widely publicised in the media and can also be found on our website.

During the year, the Sir Zelman Cowen Universities Fund, a major supporter of the Hebrew University, which had been operating for more than 42 years, was wound up by its trustees. This was due to difficulties experienced in its relationship with the University of Sydney, also a beneficiary of the Fund. However, the Fund continues its existence via restructuring.

The assets of the Fund, held by its nominee company SZCUF Nominees Pty Ltd, were donated to Hebrew U Health Promotion Pty Ltd, a deductible gift recipient, and a wholly owned subsidiary of the Australian Friends. These assets are now managed by the former trustees who are also directors of SZCUF Nominees Pty Ltd, which is now owned by the Australian Friends. The former trustees are now officially working under the banner of Zelman Cowen Academic Initiatives in association with Hebrew U Health Promotion Pty Ltd.

I am pleased to report that as a consequence of the transfer of the assets of the Sir Zelman Cowen Universities Fund to Hebrew U Health Promotion Pty Ltd, we were able to remit \$3 million to the Hebrew University for research into human health.

The success of the Zelman Cowen Academic Initiatives can be demonstrated by the responses received from virtually all Australian universities to invitations for their scientists to apply for a two year joint research project in science between Australian universities and the Hebrew University. Sixty nine applications were received to fund four or five projects. The Hebrew University will now form a special scientific committee to assess and recommend ten applications from which the directors of SZCUF Nominees Pty Ltd (the former trustees of the Sir Zelman Cowen Universities Fund) will choose the best four or five applications.

The inability of students and academic researchers to travel between Australia and Israel in 2020 and 2021 has prevented the exchange of students and researches from benefiting from the grants provided by the SZCUF and now by its successor Zelman Cowen Academic Initiatives. However, much is anticipated in the coming year which will, hopefully, enable the resumption of important research and exchange programs, supported by the Sir Zelman Cowen Academic Initiatives.

For many of the same reasons described above, the Living Legacy mission, offering a fully paid tour of Israel and the Hebrew University in return for the participant making a minimum bequest in his or her will to the Hebrew University, planned to take place in early 2020 could not proceed and this was also the case in 2021. Hopefully, a mission planned for 2022 will proceed, as planned.

We are looking forward to the re-establishment

of the Victorian Division of the Friends in 2022, as well as to the reopening of the border of Western Australia to visitors from the Eastern States and from overseas. We are planning some exciting events with some very special visitors from the Hebrew University in 2022.

None of our work would be possible without the dedication and commitment of our staff. In particular, I would like to thank our CEO, Robert Schneider, for his determination to overcome the enormous challenges experienced during these last two years. His continuing efforts to not only manage day to day issues, but also to continue with his goal of increasing awareness of the University and of communicating with donors, can only be described as exceptional. I also thank other members of staff for their dedication and hard work, especially during the lockdowns, and their ability and commitment to stay connected.

I would also like to thank our Honorary Treasurer Robert Greenfield who oversaw the changes in our accounting staff during the year, and who guided the difficult task of incorporating the Zelman Cowen Universities Fund assets into Hebrew U Health Promotion Pty Ltd, as well as liaising with the auditors to ensure that the accounts of the Australian Friends of the Hebrew University and of Hebrew U Health Promotion Pty Ltd are clearly understood by members of the Australian Friends. The Honorary Treasurer's report appears separately in this Yearbook.

MICHAEL DUNKEL  
FEDERAL PRESIDENT





## From the President NSW Friends Division

Barry Joseph

(Note this Report relates to the year-end 30 June 2021)

Unfortunately, it has been another difficult year due to the pandemic and the restrictions imposed because of it.

As reported last year, we are not able to escape this upheaval and so the situation remains much the same. Our aim and responsibility is to show case the University and keep its name in front of the Community which once again proves to be extremely difficult.

As a result of the travel bans we have been unable to welcome any overseas visitors, primarily leading academics from the university. We have been unable to hold local functions and at the time of writing we are not yet able to recommence the Honours Club meetings. However, as restrictions are now being eased we are planning a complete program from February next year. Once international travel bans are lifted we hope to be welcoming visitors from the University, once again.

Against this backdrop of problems, I must

give praise to our CEO Rob Schneider and his colleagues Deborah Cantor, Eric Berman, and Joe Gelbart. They have worked through this period with dedication and professionalism to continue the work of the University. Foremost has been the installation of our new computer system and data base management.

During the year we lost the services of Moran Pichon who returned to Israel to be with her family. She will be sorely missed in the office, and we wish her all the best. Also, Jamie Wise has left to pursue a career change but has agreed to give some assistance on a casual part time basis. I would like to thank them for their efforts during the time with us.

In closing I am looking forward to our new year, with the recommencement of our Honours Club and the flow of visitors from the Hebrew University.

BARRY JOSEPH  
NSW PRESIDENT

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## From the President WA Friends Division

A/Professor Peter Winterton AM

(Note this Report relates to the year-end 30 June 2021)

Members of the WAFHU 2021 committee:

Peter Winterton, President

Hilary Winterton

Yael Jacobson, Public Relations Officer

Lynn Swersky

Martin Brezger

Ken Budd

The committee met on two occasions this year in early February 2021 and in September 2021.

The Covid 19 pandemic's effects were evident this year both in Australia and overseas. Western Australia, has to date, been spared the worst of the effects of this scourge, and this is one of the reasons for a slow uptake in immunization rates in Western Australia. One can only hope that 2022 will be brighter for the world and for the activities of WAFHU.

Our goals, and those our parent group the AFHU remain unchanged in 2022:

- Friend raising; with friends come funds
- Fund raising
- For scholarship.
- For scholars. In WA this in the main is via the UWA- HUI exchange programme. At a national level Sydney office arranges other student exchanges with other Australian Universities.

Fund raising in WA, as elsewhere in Australia, is tough. Apart from a few generous benefactors

to date we have not been able to raise big dollars in WA in recent years. The Covid Pandemic has ensured that there have been no student exchanges in 2021.

Achieving our goals has not been an easy task especially in a small community like Perth, in very troubled economic times. UWA restructuring and the precarious state of university finances has not been conducive to our activities.

As with every challenge comes new opportunities. The changes in university course structure, using electronic means e.g., Zoom® and Teams® instead of face-to-face teaching will allow cheaper collaboration at a lower cost for exchange of ideas and knowledge between universities such as UWA and HUI. The rise of the new technologies, however, has re-enforced the importance of old technologies, i.e., face to face teaching and the world awaits re-opening in 2022.

The once in a century opportunity that awaits the Perth Jewish Community, the rebuilding of the aged and out-dated Jewish Community Centre in Yokine, will allow for better facilities to show case the community and foster intermingling of the various interest groups within the community in a contemporary environment. WAFHU is well positioned to have a foot in the door at the new venue.

The uncertainties of travel, pandemic regulations and the inability to have interstate travel have made the organization for functions neigh impossible.

We did have one function at which the prominent Israel composer and scholar Yitzak Yedid gave an amazing rendition of both his talents and his vast knowledge of middle eastern music.

A further event is planned for December 2022 in co-operation with the National Council of Jewish women. WAFHU is also involved in the end of

year community events including Mitzvah Day and the Perth Hannukah celebration. Initiatives for 2022 have been considered and planning commenced.

### Conclusion

I would like to thank Yael Jacobson for her efforts in 2021. We are grateful to the ongoing support of our loyal WA donors of the UWA-HUJ scholarship fund. The rise in community use of technology will enhance working with the youth of our community in making WAFHU relevant to them in today's world.

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## From the Federal CEO

Robert Schneider

(Note this Report relates to the year-end 30 June 2021)

When I wrote my Annual Report in November 2020, we were all hoping that the Covid pandemic would soon be behind us but unfortunately, here I am, a year later writing another Annual Report following months of lockdown and with Covid still hampering our lives.

As for many, the last year and beyond have not been easy for us. The uncertainty created by Covid and the looming threat of lockdown did not augur well for the holding of, or even planning for events.

Notwithstanding the unprecedented situation posed by the Covid-19 pandemic, teaching and research at the Hebrew University continued on campus where possible, otherwise via the Internet and as I write this report, the new academic year in Israel has begun with more students on campus than ever before – almost 26,000 students!

Some good news during this difficult period was that the Hebrew University continued to display the excellence for which it is famous and just recently, Professor Eliezer Rabinovici was elected as the President of CERN – The Council for European Nuclear Research.

A number of fascinating webinars were also held over the last year on a variety of topics

including of course Covid-19 and although the time was not conducive for Australian participants, the links to these webinars can be accessed via our website.

During the lockdown, our staff operated from home and notwithstanding this, prior to June, we were able to produce a state-of-the-art Yearbook in both hard copy and electronically which of course enabled us to reach a far wider audience. We also produced regular electronic mail-outs updating our supporters with news from the Hebrew University and beyond.

I would like to acknowledge the cooperation and support received from staff members over the last year. Unfortunately, we have seen a number of staff changes this year to be elaborated on later in my report.

### **BOARD & GOVERNANCE:-**

Sadly, I report on the sudden passing in October of NSW committee member, Richard Trayer z"l. Richard had served the Friends faithfully for a number of years and in recent times, had assisted us with issues relating to governance. His presence will be missed and we extend our heartfelt condolences to his family. May his memory be a blessing.

I express my gratitude to Michael Dunkel, Federal President for his ongoing support, wise

counsel and stewardship of the organisation. We also acknowledge his role in creating a formal relationship between the former Sir Zelman Cowen Universities Fund, now known as the Zelman Cowen Academic Initiatives and the Australian Friends. I am also delighted to report that Michael Dunkel featured prominently in this year's Hebrew University Board of Governors Meeting. He was also elected to the Executive Committee of the Hebrew University's Board of Governors. Congratulations Michael.

I am grateful for the support of all board members but in particular wish to thank the Treasurer, Robert Greenfield who has been a tremendous resource not just to the Friends, but also to me personally. Robert's input to the Friends is invaluable!

Vice President Philip Moses is our organisational memory and the man we all turn to for information regarding the past. Thank you Philip. I also congratulate Philip for being honoured by the Hebrew University with an Honorary Fellowship the conferring of which has had to be delayed until the next physical Board of Governors meeting in Israel.

NSW Friends President Barry Joseph is also a wonderful support, in particular with assessing Australian students applying for financial assistance to study at the Hebrew University.

I would also like to acknowledge a board member who goes above and beyond in terms of his commitment and support to the Australian Friends. I refer here to Phillip Joel who aside from providing valuable board input, also does our printing at discount rates and often doesn't charge at all!

#### **STAFF:-**

Our staff complement has undergone great change in recent times, however, in the financial year under review, the following staff members were in our employ:-

Moran Pitchon served the organisation in many different areas starting with student liaison and then becoming Project Manager with responsibility for implementing and managing our data management program. Moran was the most amazing asset to the Australian Friends and to our regret, returned to Israel in July this year with her husband and family. Our loss is most definitely Israel's gain and whilst she left with our blessings, she has left a huge void in our organisation.

Jamie Wise was appointed Student Liaison and Marketing Officer on a part time basis in December 2018 whilst still studying at UTS. Because of her excellent creative skills, she effectively took our marketing collateral and social media presence to higher heights and it was a pleasure having this young dynamo on board. Inevitably, Jamie was recently snapped up for fulltime employment by a company in the public relations sphere but is kindly assisting us while we look for a successor.

Eric Berman joined us recently as our part time Accounts Manager and brings a professionalism and expertise to this role which can only stand us in good stead.

Finally, Joe Gelbart, a retired engineer with much experience in data processing assists us a day or two per week as needed.

#### **OFFICE:-**

The lease on our premises expired in September this year and it has been renewed until December 2025 which provides us with some stability.

#### **DATA-BASE:-**

As mentioned in my last Annual Report, our new ThankQ data base system enables us to manage both personal and financial data on the same system.

It is our intention to also integrate payments ►►

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### **STUDENT LIAISON & MARKETING:-**

We continue to reach out to Australian students encouraging them to embark on both short term and long term studies at the Hebrew University – no easy undertaking during this time of Covid.

**Marketing:** Due to Covid, marketing this year focused on promoting online courses at the Hebrew University, and Hebrew University news. Much effort was spent on promoting the Hebrew University mainly through social media but also at the MASA Virtual School Fair organised by the Zionist Federation of Australia. Our social media now runs on a schedule, and news articles are posted regularly in addition to flyers for online courses.

**Mishpatim Seminar:** The ‘Mishpatim Seminar’ was held remotely in January 2021 with far fewer numbers than in previous years when students participated physically in Israel.

The course will be held again online during January 2022 but despite our best efforts, the interest has not been very strong thus far.

**Financial Assistance:** 12 students received scholarships this year, with USD9352 being funded in Israel and AUD20540 via Australia.

- Rabin: USD1690.14 (Middle Eastern Studies)
- Rabin (amount left in AUS): AUD20540.55 (Mishpatim)
- Domansky: USD3661.97 (PhD)
- Bialylew: USD4000 (Mishpatim)

**Statistics for 2020-2021:** 24 Australian students went to HUJI (11 online, 13 in person) between 2020-2021 compared to 76 during 2019-2020, the drop due no doubt due to Covid restrictions.

- 1 PhD student
- 1 Exchange student

- 2 Special Program students
- 2 Ulpan students
- 2 M.A. students
- 2 Mechina students
- 3 Undergraduate/Gap Year students
- 11 Summer & Short Term Program students

### **Scholarship funding:**

This year, certain of our local donors were unable to continue their contributions towards scholarship funding due to financial pressures.

It is hoped that these donors will continue to support our scholarship program when business conditions improve.

I am delighted to report however that two generous donors from Perth have continued to support our efforts to assist Australian students wishing to study at the Hebrew University and we are extremely grateful to these benefactors, indeed to all our donors, friends and supporters.

### **HONOURS CLUB:-**

The Honours Club is a NSW initiative for supporters who meet on the last Wednesday of every month in Sydney.

Covid has again presented us with challenges as the previous venue, the Theatre at the Waverley Public Library was required for the Waverley Council’s own needs and may only become available again in late 2022.

We were lucky enough to relocate these meetings to the Community Lounge at Jewish Care in Woollahra and we are very grateful to Jewish Care for this. Unfortunately, again due to Covid, no sooner did we resume meetings at this new venue when we had to suspend them because of the lockdown.

Jewish Care have advised that they will not permit gatherings in the Community Lounge until early next year at which stage, we hope that our Honours Club meetings will be able to ►►



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►► resume there otherwise at another suitable venue.

We have maintained contact with Honours Club members as well as with rostered speakers and also canvassed attendees regarding zoom presentations but the general view was that there are far too many zoom meetings and that the preference is for a small delay leading up to the resumption of physical meetings.

### **LEGACY MISSION:-**

Once again, due to Covid and the inability to travel, we had to cancel the proposed Legacy Missions in both 2020 and 2021.

We are hopeful that we might be able to consider staging such a mission towards the end of 2022.

The concept of the Legacy Mission is that thanks to the generosity of an anonymous donor, we are able to offer an all expenses paid trip to Israel for participants who can provide proof that they have included the Hebrew University in their wills for a specified minimum amount.

### **PROMOTION & FUNDRAISING:- National & NSW**

- The office in Sydney serves as both the Head Office and NSW office of the Australian Friends and provides resources and services nationally.
- Committee meetings are held every second month and where necessary, a Federal meeting is convened on the same date as a NSW committee meeting.
- Due to Covid, most of our outreach and promotion has been done at arm's length through our Yearbook, news mails and personal telephone calls and correspondence.
- As mentioned previously, the Australian Friends now enjoys a formal relationship with the former Sir Zelman Cowen Universities Fund now known as Zelman Cowen Academic Initiatives and on behalf of this Initiative, \$3million was remitted

to the Hebrew University for the purposes of an endowment for medical research in the name of the late Sir Zelman Cowen.

- During the last financial year, we remitted a substantial amount to the Hebrew University on behalf of donors concerned with a rare genetic disease called WWOX. These funds were specifically donated to support the research of Prof. Rami Aqeilan who is regarded as one of the world's most eminent researchers into this debilitating condition. We have been advised of some positive outcomes to his research that is most encouraging.
- It is also gratifying to report on the support of an anonymous donor in Melbourne who has committed substantial funding over a few years towards a unique Hebrew University program called Revivim. Revivim is designed to attract Israel's best and brightest students to a career in teaching Jewish Studies in Israel's secular middle and high schools. Revivim's combination of rigorous academic studies, a Special Academic Program, unique teacher training and individual mentorship turns its students into exceptional educators who are equipped to expose their students to Judaism's many aspects in an engaging, challenging and meaningful way. We are most grateful for this donor's commitment and support for this program.
- An amount equating to approximately \$285,000 was also donated anonymously to the Hebrew University for scholarships.

### **Victoria**

- Due to Covid, I have not been able to travel to Victoria since 2019 which is most unfortunate as Melbourne is one of our key areas for future growth.
- I would like to acknowledge the amazing assistance and support received in Melbourne from one of our Life Governors, Professor Leon Mann AO and ►►

- ▶▶ indeed also from his wife, Leah Mann AM.
- I am also grateful that Jeremy Leibler, a senior partner at ABL and President of the Zionist Federation of Australia was appointed a Governor of the Hebrew University in 2020 and I have no doubt that Jeremy will prove to be a most valuable asset to both the Australian Friends and to the Hebrew University itself.

### **Western Australia**

- We have a WA committee based in Perth and chaired by Ass. Professor Peter Winterton AM.
- This committee meets on a regular basis and enjoys the support of a part time PR Officer, Yael Jacobson.
- Articles about the Australian Friends and the Hebrew University are featured regularly in the local weekly, The Maccabean.
- A number of public events are also held in Perth under the auspices of the local Friends committee.

### **Queensland**

- Whilst we do not have any Qld. committee as such, once again, due to Covid, my travel has been limited and whilst we do have some potential flag bearers for the Australian Friends in Qld., a presence there can only really be developed through personal visits by myself.
- Articles about the Australian Friends and the Hebrew University are featured from time-to-time in the local monthly, SHALOM and the support of the SHALOM editor, David Jacobs is much appreciated.

### **NATIONAL PROMOTION:-**

- We have been very selective in our advertising especially since the start of Covid and have chosen to be part of carefully targeted Australian Jewish

News editions and supplements nationally (Melbourne and Sydney editions) e.g. Yom Ha'atzmaut, Education, National Calendar.

- The Australian Friends Yearbook – in hard copy and electronic versions
- Regular e-newsletters sharing the latest news from the Hebrew University with our supporters.
- Special greetings, sometimes with a news component, to mark a Jewish holiday or festival.

### **MEMBERSHIP:-**

During the course of the last financial year, our board took a decision to change our membership dates for ordinary members to run from Rosh Hashana to Rosh Hashana each year instead of a calendar year.

It was pleasing to find a number of past members renewing memberships and we even succeeded in attracting some new members especially from WA.

### **ISRAEL:-**

Unfortunately, the 2020 Board of Governors Meeting that was to have been held in Israel in mid-June could not take place because of Covid.

- The Board of Governors took place via zoom on Sunday 25 and Monday 26 October.
- The same arrangement unfortunately was in place just recently for the 2021 Board of Governors which was held via zoom on Sunday 17 and Monday 18 October with a further zoom meeting the next day focussing on fundraising.
- The dates for the 2022 Board of Governors meeting which we hope will take place physically in Jerusalem are Friday 10 – Wednesday 15 June.

The President of the Hebrew University, Professor Asher Cohen was due to visit Australia this year together with a high profile researcher

in the medical arena but once again, due to Covid, these visits have had to be postponed until 2022.

- Our aim is to host a world-renowned medical researcher from the Hebrew University for our major campaign in 2022.
- Hopefully, as borders reopen, we will be able to continue to make use of visiting faculty members of the Hebrew University for public functions and collaboration with other universities.
- I would also like to thank the staff at the Hebrew University for their ongoing assistance and support in particular those with whom I work with on a regular basis who include Amb. Yossi Gal, Vice President for Advancement & External Relations, Ram Semo, Director of Advancement & External Relations, Faith Segal, Head of the Australian Desk, Brenda Needle-Shimoni, Director of Donor Services, Rivkie Harel, Shoshana Israel, Sarit Petersen

and Anat Yaffe.

- On behalf of all of us in the Australian Friends and I am sure on behalf of the entire Australian Jewish community, I congratulate the indefatigable former Hebrew University Assistant Vice President Eliyahu Honig who hails originally from Melbourne. Eliyahu is due to receive a well deserved Honorary Fellowship on 23 December in Israel.
- I am also grateful for the assistance and support of my colleagues of the American Friends, the British Friends and the Canadian Friends who are always willing to share their resources with us in Australia.

Last, but certainly not least, my thanks to our members, donors, and advertisers without whose support, there would not be an Australian Friends.

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# They make it happen...



**Michelle Gold** *Michelle joined the national office in December 2021 heading up marketing, student affairs, programs and administration. She brings to the Australian Friends a wealth of experience and her warmth, diverse skills and ability to think outside of the box make her a valuable new asset to the Australian Friends.*

**Joe Gelbart** *Joe is our part-time data base wizard who brings his engineering background skills to helping manage our data-base and improve reporting systems. Joe normally attends the office 1-2 days a week and we are grateful to have the benefit of his IT and communal organisation experience.*



**Yael Jacobson** *is our part time PRO in Perth who ensures that the flag of the Hebrew University flies high in the west! Yael assists the WA Friends Committee, liaises with students in WA and is responsible for organising Friends events in Perth.*

**Eric Berman** *Eric is our part-time accountant and his experience and attention to detail has improved our reporting procedures and accounting standards. We very much appreciate that aside from his professional career, he has joined us because of his desire to “give back” to the community.*





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# Hebrew University President Professor Asher Cohen to visit Australia

The Australian Friends is delighted that Hebrew University President, Professor Asher Cohen will visit Australia later this year.

Professor Cohen was appointed President of the Hebrew University of Jerusalem in 2017 and re-elected to this position in 2021. Previously, Professor Cohen served as Rector of the university (2012-2017), leading varied important initiatives such as new faculty recruitment and the launch of innovative academic programs. Throughout his distinguished career, Professor Cohen has fulfilled numerous leadership roles in academia, including as head of the Association of University Professors in Israel.

A Hebrew University alumnus, Professor Cohen received a B.A. in Economics and an M.A. in Psychology, after which he conducted doctoral and post-doctoral studies at the University of Oregon. An expert in the field of Psychology, he served as a senior lecturer at Indiana University before returning in the early 1990s to Hebrew University's Department of Psychology where he served as head of the Department from 2008 to 2012 holding the Samuel Sturman Chair in Psychology.

A specialist in the field of cognitive science, Professor Cohen has focused on the relationship between the human perception system and human response mechanisms in situations that require very fast motor responses. In the framework of his research, Professor Cohen and his team developed a theoretical model that successfully predicts the situations in which performing two tasks simultaneously will lead to a decline in



*Professor Asher Cohen*

abilities. He has had numerous articles published in scientific journals and has often spoken at international conferences on topics ranging from the role of implicit learning to cognitive aspects of task performance.

Professor Cohen brings to his position extensive knowledge about the university, a longstanding commitment to students and faculty, and public service in the realm of higher education. Committed to public education, he also serves on the board of the Florence Melton School of Adult Jewish Learning.

During his visit to Australia, Professor Cohen is likely to visit Melbourne, Perth and Sydney. This will be Professor Cohen's first visit to Australia.

# Hebrew U. Physicist Elected As President Of The World's Largest Nuclear Research Centre

Prof. Eliezer Rabinovici  
Becomes President Of  
CERN Council in Geneva

Towards the end of 2021, the CERN Council announced the election of Hebrew University of Jerusalem (HU) physicist Professor Eliezer Rabinovici as its 24th President as of January 2022. Based in Geneva, Switzerland, CERN is the largest nuclear particle research center in the world. Rabinovici has taken over the helm of this organization from Dr. Ursula Bassler, who concluded her term at the end of 2021.

“Professor Rabinovici is a brilliant theorist in the most advanced fields of research. During my presidency, I very often had the occasion to exchange with Professor Rabinovici, whose advice and contributions have always been very helpful to steer the ongoing discussions. I am confident that the Council is welcoming an excellent President, whose concern for science is of the utmost importance,” shared Bassler.

Professor Rabinovici is currently a professor at HU's Racah Institute of Physics and the Louis Michel visiting chair at the Institut des Hautes Études Scientifiques (IHES). He received his PhD in high-energy physics at the Weizmann Institute of Science in 1974 before working as a research associate at Fermilab and at Lawrence Berkeley Radiation Laboratory. In 1977, Rabinovici returned to Israel and the Hebrew University as a senior lecturer, where he later served as Racah's Director from 2005 to 2012.



*HU Professor Eliezer Rabinovici,  
24th President of the CERN  
Council (Credit: CERN)*

Professor Rabinovici's main field of research is theoretical high-energy physics and, in particular, quantum field theory and string theory. He has made major contributions to the understanding of the phase structure of gauge theories, which are the building blocks of the Standard Model, and the uncovering of



the phases of gravity. Throughout his career, Rabinovici has held positions within several councils and committees, such as member of the HEP-EPS Board, Chair of the Israeli Committee for SESAME and Chair of the Israeli High-Energy Committee. In 2004, he was appointed as one of Israel's delegates to the CERN Council, where he served as Vice President from 2016 to 2018.

“CERN is a special place where science and collaboration meet to answer some of the most fundamental questions about the world we live in. Throughout my 16 years as a member of the CERN Council, I have, time after time, been captivated by the commitment, collaboration and knowledge of people who work together towards the same mission. I am honored that the Council chose me as their next President, and thankful that I get the opportunity to serve CERN's scientific community,” said Rabinovici.

Upon hearing the news, HU President Professor Asher Cohen congratulated Rabinovici, adding, “The election of Professor Rabinovici as president of the CERN Council is a badge of honor not only for Hebrew University but for the State of Israel and its institutes of higher learning.”



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# Honorary Fellowship Conferred on Eliyahu Honig

HU's Former Assistant Vice President

*Article written by Greer Cashman and featured in the Jerusalem Post*

It may not be a world record, but nonetheless there are not too many people who can say that they have worked for the same employer for 63 years, the last 10 in a voluntary capacity.

But that's not the only reason that Eliyahu Honig received a standing ovation from relatives, friends and colleagues at the conclusion of the ceremony at which he was conferred with an honorary fellowship of the Hebrew University, which he has represented for so many years in Israel and abroad. Aside from a full auditorium at the university's Senate Hall on Mount

Scopus, there was a huge screen depicting Zoom participants from around the world who were heads or simply members of Friends of the Hebrew University associations who had, over the years, enjoyed personal relationships with Honig.

Born in Melbourne to immigrant parents who were born in Jerusalem and Hebron, Honig, 91, is a hiccup in a 10-generation family of Jerusalemites. He first came to Israel in 1950 as the sole representative of Australia in the Maccabiah Games. Returning to Melbourne, where he had been active in Habonim, he completed his university studies, and in 1955 made aliyah with his wife, Helen. ►►



*Conferring of Honorary Fellowship upon Eliyahu Honig by Hebrew University President Prof. Asher Cohen*



*Congratulating Eliyahu Honig (in centre) are Prof. Asher Cohen (L) and Amb. Yossi Gal, Vice President for Advancement and External Relations (R).*

►► Eager to advance his studies, he enrolled at the Hebrew University, where he also found employment, and where his organizational talents and his gift for public speaking were quickly discovered. Over the years, his positions at the Hebrew University included director of the department of public relations, and associate vice president and honorary member of the board of governors. He was also a university emissary, visiting many countries abroad.

A series of speakers spoke of his phenomenal memory for anything related to the history of the university, the respect and admiration he has earned as a symbol of commitment, his ability to make people fall in love with the university, his friendship in Habonim with Berel Ginges, which in later years resulted in Berel and Agnes Ginges computer centers and libraries throughout the university, his encyclopedic knowledge about people, and his ability to marry donors to projects that genuinely interested them.

Ram Semo, the current director of public relations at the Hebrew University, said he felt strange acting as master of ceremonies while Honig was on the stage, because that had been Honig's role at so many events in the past. University Chancellor Prof. Menahem Ben-Sasson, who was the fifth of 10 of the university's presidents with whom Honig worked, delivered a lecture on Maimonides and his philosophy on eight degrees of giving charity, the first rule of which is that the recipient should not know the identity of the benefactor, and the benefactor should not know the identity of the beneficiary.

Though a champion in securing donations for the university, Honig, in addition to working for the university, established the Honig Foundation, which provides scholarships to students of Ethiopian descent.

The general custom relating to recipients of honorary fellowships is that they receive the



*The Honig family attended the ceremony in full force*

pin and the certificate from the president of the university, but they don't make a speech. An exception was made in Honig's case.

After several thank-you's to his wife and partner of 70 years, Honig noted that four generations of his family were present. He had

been fortunate, he said, in having great mentors and learned many things such as "Be sincere and be yourself. Don't try to emulate others. Listen, because when you listen, you learn. Know when to lead and when to follow. When you want harmony, someone must always play second fiddle."

# Tribute to Eliyahu Honig

*By Michael Dunkel*

*Federal President of the Australian Friends of the Hebrew University*

Eliyahu has been described as the principal emissary and fundraiser for the HU who became the messenger par excellence in conveying the message of this key institution in the diaspora.

Eliyahu was born in Melbourne to parents who migrated from British Palestine in the late 1920s to escape from the desperate economic hardship which befell the holy land at the time.

As a teenager, Eliyahu joined Habonim, in which he became a prominent figure and leader and where he met his wife Helen, as well as a new friend, Berel Ginges from Narrabri, a small town in New South Wales, who had come down to Melbourne to a Habonim camp. They were both aged 16.

In 1950 Eliyahu was the sole Australian representative at the third Maccabiah games, as a tennis player. Eliyahu studied Hebrew and English literature for a period in the University of Melbourne and was also a keen student of Yiddish, which he inherited from his father, and the love of which, he has retained to this day. Inspired by Habonim, he decided to make Aliyah with his wife Helen, via London, in 1955.

Eliyahu's association with the University began

when he was offered the position of dealing with wills and bequests, which required the knowledge of English. He soon moved from this position to one of public relations and started to work with Bernard Cherrick, a towering figure at the time.

There were many visits to Australia by Eliyahu, initially with Bernard Cherrick and later with Abe Harman. He also came to Australia on numerous occasions on his own. Each visit, principally to Sydney and Melbourne bore fruit for the University.

In Sydney, Eliyahu, met in the early days with one of the greatest Australian Zionists, Max Freilich who had played an important role, through his friendship with Dr H.V. Evatt, the Australian foreign minister and the then president of the UN General Assembly in the Australian vote in November 1947 in favour of the establishment of the State of Israel. Eliyahu also met and, together with Max Freilich, influenced John Hammond, a successful, if rather eccentric businessman, who had been denied admission to university in his native Hungary because of the Jewish quota.

Hammond migrated to Australia in 1937, and became the president of the NSW Friends of the Hebrew University in the 1970s, and set up the Sir Zelman Cowen Universities Fund in 1978. Eliyahu, with his vast encyclopaedic knowledge ►►

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SCAN THE CODE



*L/R Michael Dunkel, Annette Dunkel, Eliyahu Honig*

►► of the individuals he met over the years, knew that his friend from Habonim days, Berel Ginges, was related to John Hammond. Berel's wife Agnes was John's niece, and so Eliyahu set about describing to Berel the areas of the University most in need of support.

As we can all see on every campus of the University, the Ginges computer centres and libraries stands out today, not only as a testament to the generosity of Berel Ginges, but also as an achievement of Eliyahu Honig.

Eliyahu's achievements in Melbourne were as substantial and as important as those in Sydney. First and foremost was his friendship and association with Isadore Magid with whom Eliyahu worked closely over the years and who enabled the creation of the Magid Institute at the University, as well as with Ron Castan who also worked closely with Magid. Eliyahu worked very productively with Issy Blankfield, and with Sam Lipsky. There were many supporters in Melbourne including some well-known individuals such as Victor Smorgon and Richard Pratt.

It is interesting to note that the Golda Meir

Fellowships were created by donations from, firstly the U.S. and secondly from Australia. Quite a lot of support came from the Melbourne community. That is directly attributable to Eliyahu.

Australia's foremost Jewish historian, Prof Suzanne Rutland describes Eliyahu as a warm, outgoing personality with a sense of humour, a man of integrity, honesty and reliability, and an intellectual. A man who could relate to his donors, able to marry the donor to the program which would be meaningful for him or her, and consequently was always able to show results.

To us, in Australia, Eliyahu has always been a mentor, a guide, the consummate diplomat and a source of inspiration. He has brought the light unto us to enable us to better support the light unto the nations.

Eliyahu, all of us here in Australia congratulate you on your receiving this important honour today which you richly deserve. We all wish you many more years in good health and much naches from your many years of devoted service on behalf of the foremost institution in Israel.

# The Hebrew University of Jerusalem is Proud to Present Israel's First and Currently Only Centre For Computational Medicine

Computational Medicine –  
Leveraging the flow of information



*The Computational Neuropsychiatry Lab, Hadassah Hebrew University Medical School*

The Faculty of Medicine of the Hebrew University offers a new vision **to bridge the gap between data and patient**: the new **Center for Computational Medicine**.

The Center will implement a transformative approach to combatting disease, by integrating computational data analysis into medical research and practice, and by preparing the next generation of computationally-trained doctors and researchers. No such entity currently exists in Israel, and awareness of the potential of this approach is only now reaching leading institutions worldwide.

The Center will pioneer a new work-flow, starting with the acquisition and integration of detailed disease data, continuing with in-depth data analysis and hypothesis generation, and arriving at the development of novel methods for precision (personalized) disease diagnosis, treatment and prevention.

At the heart of this initiative will be a core team of leading researchers and clinicians with expertise in computational approaches to biomedical research and clinical treatment. Some of these specialists will be recruited upon the establishment of the new Center and the construction of its new home. In addition, a broad group of life- and data-science researchers within and outside of the Hebrew University will be affiliated with this initiative, conducting and supporting research and facilitating the development of individualized therapeutic treatments.

### **The New Home for Computational Medicine**

**Disease Data Acquisition Unit:** This unit will be the locus for obtaining disease information directly from patient samples, employing standardized procedures for clinical-level collection, storage and molecular data extraction, to generating new

comprehensive patient-disease databases which will be constantly expanded and updated, as well as a bank of live and frozen disease tissue samples for research and follow up.

**Bioinformatics Unit:** This unit will conduct computational medicine data integration and analysis, the development of new data-based methods for diagnosis, treatment and prevention, and the application of the most advanced approaches in computer science, artificial intelligence, machine learning, and others to improve health.

**Disease Research Units:** Here, scientists will have the resources to conduct in-depth research into the causes and potential treatments of disease, applying computational approaches to advanced disease models. This section will include dedicated units devoted to cancer, aging, metabolic diseases, and inflammatory and infectious diseases. It will support disease-focused research by providing platforms for disease modeling, including genetically-engineered disease cells (CRISPR) and animal models, as well as advanced disease analysis facilities, including imaging, metabolism, behavior and genetics. The work of this section will be supported by specially trained auxiliary personnel/technicians to aid in the research. It will include a translational medicine unit devoted to bringing newly developed diagnostic tools, drugs and therapies into clinical application, supporting therapy design and testing.

**Disease modeling and Therapy Testing Unit:** This unit will provide the support needed to take promising research directions and advance them to therapy design and testing, using biological disease models such as genetically engineered mouse models (GEMMs) and others.

**Teaching Units, Innovation Hub and Research Support:** The Faculty's School of Medicine is currently creating new programs ►►

►► to train medical students, graduate research students, physicians, scientists, and industry professionals in computational approaches to medicine. Among them is the new Sagol Program for Computational Medicine. The Elite Military Medicine Program (*Tzameret*) will also

be on these floors, along with an Innovation Hub – a space to nurture and develop new related companies and products. These floors may also include expansions of research support units. This space will be renovated as part of a later phase of the project.

## How Computational Medicine Is Changing Healthcare

### The Challenge

In many cases, cancer is diagnosed in patients too late in the game – once the cancer has already spread. At that stage of the cancer, the rates of survival drop dramatically.

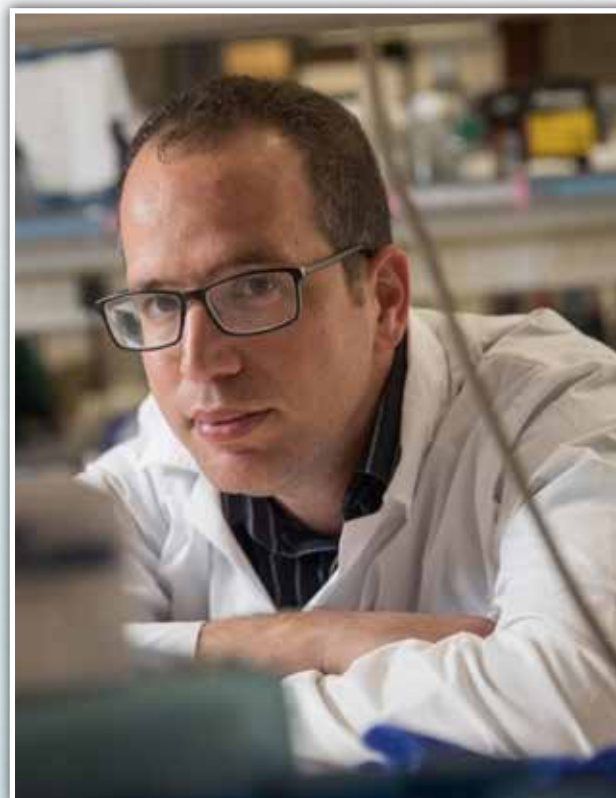
### The Solution

Professor Yuval Dor and Dr. Ruth Shemer of the Hebrew University of Jerusalem, teamed up with Professor Ben Glaser, Head of the Endocrinology Department at the Hadassah Medical Center, to develop a groundbreaking blood test. A test that could determine not only if one has cancer, but in which part of the body. “Our work demonstrates that the tissue origins of circulating DNA can be measured in humans.

This represents a new method for sensitive detection of cell death in specific tissues, and an exciting approach for diagnostic medicine,” said Dr. Ruth Shemer of the new technology.

When cells die, they release DNA fragments into the circulatory system. The blood test Professor Dor, Dr. Shemer, and Professor Glaser have developed can analyse these DNA fragments to determine in which tissues cell death has occurred and why. This simple, non-invasive test could be the difference between detecting cancer months before it spreads and moments after it’s too late.

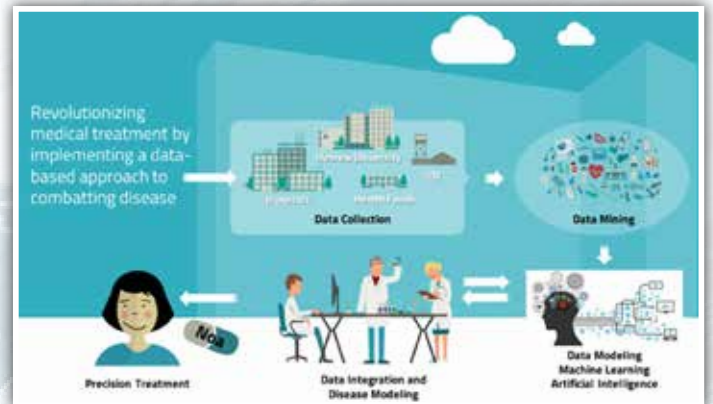
“In the long run, we envision a new type of blood test aimed at the sensitive detection of



tissue damage, even without a-priori suspicion of disease in a specific organ. We believe that such a tool will have broad utility in diagnostic medicine and in the study of human biology,” Prof. Benjamin Glaser said of its potential.

### The Implications

Doctors perform blood tests all the time, but none this comprehensive. This blood test holds the potential to drive multiple medical advances, from unlocking a deeper



understanding of human tissue dynamics to providing a more efficient method of monitoring responses to medical therapies. It also provides the ability to detect multiple disease processes—including not only cancer but also diabetes, traumatic injury, neurodegeneration and other pathologies involving abnormal rates of cell death—in a highly sensitive and specific manner. Most importantly, this technology can provide earlier interventions to life-threatening diseases like cancer.

### The Potential

Once fully developed, this technology can be applied to detect multiple diseases in early stages including Alzheimer’s, Parkinson’s and Diabetes. For many of these diseases, the current lack of biomarkers is a major barrier to the development of effective therapies.

### Going Forward

The project described above is just one of the many possibly lifesaving research endeavours underway at the Hebrew University. To realize the potential of this work as well as that of the over eighty different research groups at the Hebrew University’s Faculty of Medicine, the University’s plans to construct a state-of-the-art biomedical research complex with a focus on computational medicine are well underway. The Centre for Computational Medicine will bring together an interdisciplinary team of scientists, clinicians, and computer scientists

backed by skilled technicians, vital equipment, and bright research students, all dedicated to using the power of data and the latest technologies to improve human health.

### Applying Computational Tools to Curing Cancer

Dr. Yotam Drier, from the Lautenberg Center for Immunology and Cancer Research at the Hebrew University, has set out to cure cancer. Using sophisticated computational methods, he is able to decipher the complex mechanisms that regulate the activity of thousands of genes and show how these mechanisms go awry in cancer.

### Cancer: The Evasive Killer

Cancer is the number one killer in western society, and has proven a formidable disease to combat. One reason is that cancer cells are constantly changing (mutating) while also multiplying, acquiring new abilities and evading therapies. How do cancer cells do this? The key lies in mis-regulation of their genes.

Cancer occurs when one of the trillions of cells in our body begins multiplying uncontrollably, giving rise to a tumor mass. This may be caused by gene overactivity or under-activity. For example, a gene might receive mis-repeated instructions to multiply (thus growing out of control), or a gene meant to block cell growth may become inactive. As cancer progresses, ►►



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►► several such key genes tend to mutate, resulting in permanent changes to their activity.

Yet perfectly healthy genes can still drive cancer. How? The answer lies in the regulatory DNA, the “other” 97% of our DNA that does not contain genes. These regulatory elements dictate which genes are active within each cell, but it is not very straightforward. Their complex interactions, with each other and with multitudes of genes, make it challenging to uncover how they work.

### **At the Cutting-Edge of Cancer Research**

Using advanced tools for genetic analysis and novel computational algorithms, Dr. Drier’s work has revealed several key ways in which gene regulatory elements can drive cancer:

**Epigenetics:** Chemical “markings” upon the regulatory DNA affect how the genes are regulated. Numerous simultaneous epigenetic changes can drastically change gene activity and drive cancer.

**3D genetic “tangles”:** Each cell contains a sort of “tangled” DNA pom-pom, in which genes and their regulatory elements are in close proximity and interact. This structure is often changed in cancer cells. Without proper interactions, genes are not properly activated, driving cancer.

Dr. Drier has successfully associated between particular changes to the regulatory DNA and specific types of cancer, including pancreatic neuroendocrine tumors, tumors of the salivary gland, and others.

“I’m aiming to systematically uncover the code of regulatory DNA and its disruption in cancer. This will allow us to both better understand how basic processes are regulated by, and encoded in, the DNA, as well as to uncover what drives various tumors we do not yet understand. We can suggest better strategies to manage these diseases and new drugs for targeting them.”

At the Frontier of Computational Medicine Dr. Drier’s lab team applies cutting-edge experimental techniques to studying and characterizing tumors in high throughput. In other words, rather than studying a specific gene or type of cancer, he studies a system: the entire cancer genome. Dr. Drier’s lab generates and analyzes a significant amount of data, including the tumor’s genetics, epigenetics, structure, gene expression, and more.

By applying powerful algorithms, Dr. Drier integrates his findings with other databases and develops computational models capable of predicting cancer-driving events, focusing on changes to regulatory DNA elements. Such events may include changes and differences among healthy and cancerous cells and what causes the cancer to appear, keep growing, and metastasize. In other words, Dr. Drier is capable of predicting the function of observed changes to regulatory DNA and their role in driving cancer.

Dr. Drier is currently taking a very broad approach; after identifying specific regulatory DNA alterations responsible for causing a particular form of cancer, his team will experimentally check whether indeed introducing these changes to cells causes the predicted outcome in order to establish cause and effect between regulatory DNA changes and cancer (rather than mere correlations).

Dr. Drier’s work is at the forefront of computational medicine, both at the Hebrew University and globally. His work has greatly contributed to our understanding of how disruptions to regulatory DNA can lead to cancer, and his breakthroughs are illuminating new ways to treat cancer patients.

“I am very grateful for the opportunity to work in the diverse and stimulating environment that the Hebrew University’s Faculty of Medicine provides, where collaborations naturally form between physicians, experimental biologists, and computational biologists, an intersection that provides for very rewarding science.”

# A Man For All Seasons

Professor Ya'akov (Koby) Nahmias  
to visit Australia in December!

During the last few years, one of the most familiar faces of the Hebrew University has been that of Professor Koby Nahmias who is a world renowned scientist and professor of Bioengineering at the University.

Among numerous other achievements, Professor Nahmias led a team of researchers in introducing a new technological approach that has the potential to rapidly develop new drugs without the need for animal experiments.

According to Professor Nahmias, “Drug development is a long and expensive endeavor that is defined by multiple failures. The main reason for this failure is that clinical experiments are ultimately based on minimal information gained from animal experiment which often fail to replicate the human response.”

The primary animals used in drug development are rodents; mice and rats with different genetics, physiology and metabolism than humans leading to a situation where successful therapies in rodents often fail in clinical trials.

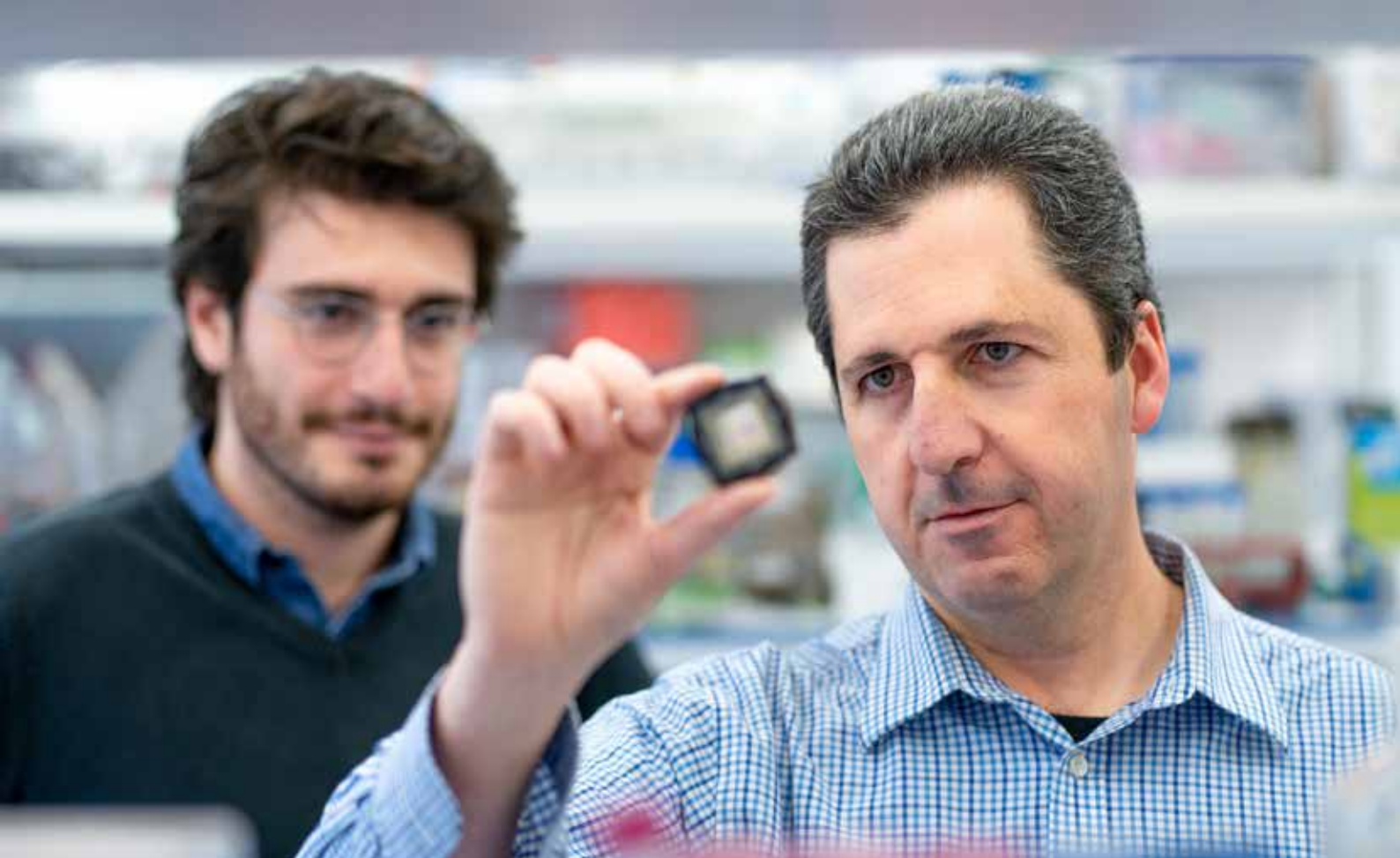
The Hebrew University team developed human-on-a-chip technology, using human tissues in a device, which mimics human physiology. While this type of technology has been in place for over thirty years, Professor Nahmias’s research - which has been published in the

Science Transitional Medicine - incorporating microscopic sensors in the human tissue itself enabling the team to precisely monitor the body’s response to specific drug treatments.

“What makes our technology unique is that it allows us to go beyond what was ever possible with animal experimentation. We are now able to insert microsensors that offer us real time information on how drugs work and when they stop working,” Professor Nahmias says.

Utilizing this new technology, the researchers were able to show that a commonly used cancer drug, cisplatin, causes a dangerous buildup of fat in human kidneys. They were then able to combine this chemotherapy with a different drug, empagliflozin (Jardiance), designed to limit the absorption of sugar in the kidneys, to reduce the fatty buildup damage and minimize the kidney damage experienced by cancer patients during therapy.

This application represented the first time that the bionic chip was used to develop a drug protocol while avoiding the traditional dependence on animal testing. “This groundbreaking technology has the potential to significantly reduce the testing and production time for drugs while also avoiding the need to test animals in the lab. This will save time, money and certainly unnecessary suffering” says Professor Nahmias.



*Prof. Nahmias holding the famous chip*

Earlier this year, Professor Nahmias gave an illuminating presentation to the Hebrew University's Executive Committee on how his company, Future Meat is contributing towards the fight against global warming by reducing the amount of carbon dioxide released into the atmosphere by cattle and sheep farming.

Meat has been an integral part of our culture since the dawn of humanity. We crave meat, celebrate it, but its production is becoming unsustainable. Animal agriculture utilises over 80% of the world's habitable land, 30% of our freshwater supply, and is a major driver for deforestation. Growing population and dietary changes are predicted to lead to scarcity and escalating prices.

With the assistance of the Hebrew University's innovation and technology transfer arm YISSUM, Professor Nahmias has been integral in the establishment of Future Meat Technologies which meets this challenge by

advancing a cost-effective solution for cellular agriculture, that is scalable and sustainable by design. Future Meat Technologies animal-free meat does not compromise on nutritional value, aroma or flavour.

Future Meat Technologies ground-breaking process starts with GMO-free animal cells that grow indefinitely without animal-derived components. Cells are grown in patented bioreactors that can replace barns, chicken coops and meat processing factories. Products are indistinguishable from animal-based meat.

This distributive technology is sustainable and cost-effective, and due to rapid growth cycles, it allows producers to quickly adapt to changing market demands.

Future Meat Technologies immortalize animal cells without genetic modification, making its cell source uniquely GMO-Free. The company's ►►



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►► cells show fast growth, doubling in mass every 24 hours. Thus, the manufacturing process lasts only two weeks allowing producers to rapidly change chicken, lamb and beef production within a few weeks' notice.

Future Meat Technologies patent-pending method to grow cells in suspension, without carrier beads, enables 40-fold higher production yields. It's unique rejuvenating bioreactor design drastically reduces the volume of feed media used in manufacturing by 20-fold, by eliminating waste products radically reducing costs.

The final word comes from Prof. Nahmias who says "Our goal is to make cultured meat affordable for everyone, while ensuring we produce delicious food that is both healthy and sustainable, helping to secure the future of coming generations."

We are very much looking forward to seeing Prof. Nahmias in Australia and to hearing firsthand about some of the amazing research he is involved with and where this may lead to in the future.



Prof. Ya'akov "Koby" Nahmias is a bioengineer and innovator, whose breakthroughs ranged from the first 3D printing of cells to the first commercial human-on-chip technology. He is a Magna Cum Laude graduate of the Technion, Israel Institute of Technology, and is the founding director of the Grass Center for Bioengineering of the Hebrew University of Jerusalem. Nahmias is a recipient of a NIH career award, two European Research Council (ERC) grants, the Kaye Innovation Award and the prestigious Rappaport Prize in Biomedical Research. He is the first scientist outside Britain to win the Rosetrees Trust Prize. Nahmias is the co-founding director of BioDesign-Israel. An entrepreneurship program that educated over 120 fellows, raising \$3M in investment and 10 startup companies including [Guide In Medical](#), [CardioVia](#) and [VenoVision](#). Nahmias is the founder and CSO of two biotechnology startups, including [Tissue Dynamics](#) that is developing a groundbreaking human-on-chip instruments for drug development, and the Tyson Foods-funded [Future Meat Technologies](#) focusing on the cost-effective production of cultured meat.



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# An Australian at Hebrew U

Nicky Gluch, alumnus of the Hebrew U  
and NSW Committee Member of the  
Australian Friends of the Hebrew University

I have always found it significant that I first attended the Hebrew University in the guise of an Australian, rather than a Jew. It was August 2012, and I had been invited to Jerusalem as a member of the Australian delegation to the 6th Asian Science Camp, which was being held at Givat Ram. The Camp was remarkable for many reasons, not least for how it situated Israel in the modern world. The Israeli delegation, the largest at 35 members, comprised students from all over Israel, from all religions, and all walks of life. I was so proud that Israel had chosen to represent itself in this way, and equally proud of the tours we were given which explained the significance of the land to the three Abrahamic faiths. I have been asked if the root of this pride was a need to divorce Israel from its identity as the Jewish homeland. My answer is that, to the contrary, my pride was seated in our homeland being so inviting of diversity and difference. I was proud that Israel was sufficiently sure of its own identity to be able to embrace plurality. That it could stake its claim not only as a small country in the Middle East, but also as a country that sits at the crossroads of Europe, Asia and Africa, and educates for and to this purpose.

My experience at the ASC encouraged me to interrogate my own identity. After high school, I had enrolled at UNSW in a Bachelor of Medical Science with the goal of continuing on to pursue medicine. The problem was, I wasn't happy. The learning wasn't the cause – that I adored – but rather a feeling that, somehow, I had displaced



*Nicky Gluch*

a part of myself. In my experience (which I recognise is personal and not generalisable) I found that the further I pursued science, the more I encountered confusion as to how I could practice religion. Science was held up as the pinnacle of rationality, with religion deemed fundamentally incompatible. But I could not agree with this dualism. What had been so wonderful for me about attending the ASC was learning from prize-winning geneticists who wore kippot; or hearing from Nobel Prize ►►

►► winner, Robert Aumann, a mathematician who sought codes in the Torah, such was the depth of his faith.

When I applied to study at the Hebrew University, it was in search of a feeling of freedom; a desire to experience a world where dichotomies became paradoxes. What I experienced was all that, and more. So inspirational was my time at Hebrew U, that it led me to change career paths from medicine to music, out of a desire to work in a field that bridged difference and brought people together.

That is what Hebrew U has always meant to me – an oasis of peace amongst the conflict, where students from all over the world gather to ponder, and live and learn. Since my time there, I have sought work that allows me to further that ethos, and even wrote a book in an attempt to combat the narrow perspective of Israel held by so many in this country. My memoir, *The Universal Language* celebrates what is possible when we look beyond difference. It is a tribute to the Hebrew U, as a remarkable institute, and a tribute to those I knew there – be they from Israel, Australia, or America – who inspired me, then, and continue to do so today.

A decade on from the ASC, I am in the final stages of a PhD which builds on ideas I first developed as a student in Israel. I have also recently joined the committee of the Australian Friends of the Hebrew University, as I am committed to encouraging other Australians (both Jewish and non-Jewish) to study at the Rothberg Institute, for all that the experience can bring. I end this piece with an extract from my book, which speaks to the aforementioned themes of education and diversity – I hope you enjoy!

### **Excerpt from Nicky's book**

Let's speak in three languages just for a moment – Migdal Ha'Bavel, La Tour de Babel, The Tower of Babel – and think about the origins of



*Hebrew U Prof. Robert Aumann, Nobel Prize Laureate*

translation. Back in Sydney after my study period in Israel, I found myself missing the Hebrew language. I ventured up to the seventh floor of my university library and, expecting purely academic texts, discovered that Amos Oz had once made it onto the syllabus. His hardback books, jackets removed, were like a deliverance: the characters' flaws in keeping with my own, the same brown bread comforting, the same love of nature and political confusion writ onto the page. Once, I took his books to my biochemistry labs, for entertainment while the chemicals we obediently pipetted did what they did, with the same lack of understanding as we had about their function. My classmates sat on their phones and so I read, and at one point I remarked on an oversight in the translation and they looked at me, dumbfounded. I realised that to them, Babel had never fallen. Words were simply 'in other languages'. But it is in translation, as George Steiner points out, that understanding occurs. Steiner, with whom those philosophy classes began, before ... though his book was called 'After'. After Babel – what rises from the chaos? The beauty of understanding, the pain of mis-understanding, or the destruction of not understanding.

To Steiner Babel babbles as he contemplates language in its infancy, and our own. For when does language start to shape us? When our tongue begins to form sounds, or before? As we sit in the babbling womb, or before? Is language coded into the four letters of our DNA? To me, Babel is one step from bible. Some Jews believe



that darkness descended upon the earth for three days when the Torah was first translated. Why? Not because we fear the vernacular. We are instructed to learn the language of any place we live. No, perhaps because it permits the thinking that: ‘Bereishit barah Elokim et ha’shamaim v’et ha’aretz’ is ‘Au commencement, Dieu créa le ciel et la terre’ is ‘In the beginning God created the heaven and the earth’. But they are not the same, and it is impossible to talk about religion until we accept that ...

This was an idea raised by my philosophy professors, Jack. He talked as he walked, his kippah askew. He perched on tables, window ledges, expounding ideas and pointedly asking questions to which he did not want the answer. You’d try to speak, sweating as all eyes turned to you, until you learnt that nothing was ever correct, nor wrong, and from shuddering, you’d learn to sit in awe. The third stage was feeling permitted to question. Jack did not encourage fraternisation. His classes were without interval – one-act plays that demanded your full attention. After an hour and a half, the curtain would go down and we’d spill out (the actor did not like to discuss his performance), sometimes talking with all our bottled energy, other times preferring contemplative silence.

In the second week, my housemate, Leanora, joined the class. In our apartment, on our low blue couch, we’d discuss the readings, and Leanora would tell me of Rilke and Foucault and love, always love. Leanora worked in common spaces, I in my room, pages everywhere. A borrowed Bible sat on my bed as I searched its English pages to make sense of Steiner, who was born French. And by this time, we’d moved on to Jacques Derrida who writes so wisely of the Hebrew God, “He at the same time imposes and forbids translation.”

But this was still ‘before’. Before what happened which led me to sit, today, writing a thesis on simultaneity ... before what made me contemplate why it matters that ‘Bereishit barah’ is not ‘Au commencement’ is not ‘In the beginning’. Because when I studied Babel, I was a scientist, I was to be a doctor. I was working in Hadassah Hospital, finding that I could speak without words. That being kissed by an Arabic grandma after you’ve put on her socks needs no translation and that death has its own particular sound. After, I ended up in London; I went to Morocco; I read Elias Canetti. And sitting in Hampstead, where Canetti himself used to live, I read these words: ‘What is there in language? What does it conceal? What does it rob one of? ... in Morocco I made no attempt to acquire either Arabic or any of the other Berber languages.

I wanted to lose none of the force of those foreign sounding cries.’ The beauty of the chaos, a search for understanding. It all began with ‘Babel’, the knowledge that language is a part of us: la langue, the tongue – the very reason the Hebrew University was founded!



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Nicky Gluch is a final year PhD student at the Sydney Conservatorium of Music and has been a presenter with 2MBS Fine Music Sydney since 2015.



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# Extending Women's Fertility & Reversing Aging in Human Egg Cells

“Within a decade, we hope to increase fertility among older women using anti-viral drugs”  
Hebrew University's Dr. Michael Klutstein.

Throughout much of the world, increasing numbers of women are delaying having their first child until they are in their late thirties, and even into their forties. At this age, their eggs are rapidly deteriorating and, even with IVF, their prospects of conception are far from guaranteed.

Reversing that deterioration is the ultimate goal of molecular biologist Dr. Michael Klutstein, head of the Chromatin and Aging Research Lab in the Faculty of Dental Medicine at the Hebrew University of Jerusalem (HU). This possibility has now come one step closer with recent research from his lab, carried out by PhD student Peera Wasserzug-Pash. in collaboration with clinicians from Hadassah Medical Center and Shaare Zedek hospitals. Their findings were published in *Aging Cell*.

In humans, egg cells begin to accumulate damage to their genetic material when a woman is relatively young. Often by the time she is in her late-thirties, her eggs have accumulated so much damage to the DNA that they are unable to mature and be fertilized. Dr. Klutstein's team successfully identified one of the aging processes that prevent the successful maturation of an egg cell. Most importantly among them is the loss of the regulation processes that normally stop the damaging parts of DNA from becoming active.



*Michael Klutstein Photo Credit HU*

It is in many ways a strange idea to think about: parts of our DNA contain sections of genetic material that can be damaging. In fact, about half of our genome is made of virus-like



sequences or fragments of viruses, which can cause considerable damage to the DNA if they are allowed to be activated through expression. This idea has been studied extensively, and was discovered by Barbara McClintock who received the 1983 Nobel Prize for her work on this topic.

It is the aging process that causes the failure of the system to keep these damaging elements repressed and inactive. Klutstein and his HU team's research, using mouse and human egg cells, not only identified the details of these processes but showed how they are interrelated and ultimately prevent an egg cell from maturing.

To confirm their findings, the team then used chemicals that mimic the actual processes that stop repression of sections of the egg cell's DNA and liberate the DNA-damaging viruses. Reproducing the aging processes artificially enabled the team to link the processes of loss of genomic regulation and the expression of damaging elements in aging egg cells.

The final stage of their research tested ways to reverse the destructive aging processes at work in an egg cell. If viruses or parts of viruses were released and activated in aging eggs, then perhaps anti-viral drugs could prevent this process and the resulting damage.

In their paper, the researchers showed that anti-viral drugs did indeed reverse the process in mouse egg cells and returned to their former youthful selves! There has also been similar success using genetic manipulation to insert two genes into the mouse egg cell DNA – the implanted genes produce enzymes which prevent the chain of events that leads to the activation of the damaging parts of the DNA. “Within a decade, I hope we will be able to increase fertility among older women using anti-viral drugs,” shared Klutstein.


***Loss of heterochromatin and retrotransposon silencing as determinants in oocyte aging***  
***Peera Wasserzug-Pash, Rachel Rothman, Eli Reich, Lital Zecharyahu, Oshrat Schonberger, Yifat Weiss, Naama Srebniak, Yaara Cohen-Hadad<sup>2</sup>, Amir Weintraub, Ido Ben-Ami<sup>2</sup>, Hananel Holzer and Michael Klutstein. Aging Cell, 2022, e13568. DOI: 10.1111/acel.13568.***


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## Celebrating WOMEN IN SCIENCE

To mark 2022's International Women's Day, the Hebrew University salutes some of its most noteworthy female researchers.

May their achievements spearhead ever greater successes for the Hebrew University and the world.

### Dr. Dina Schneidman

Rachel and Selim Benin School of Computer Science

For the last two years, Dina has been leading a series of studies that have deepened our understanding of the SARS-CoV-2 virus and potential cheap and effective neutralization methods that employ nano-antibodies. Her research combines machine learning with computational-structural biological methods that Dina herself developed. The study was part of an international collaboration that included researchers from the University of Pittsburgh. Dina and her colleagues identified nano-antibodies that neutralized the coronavirus in animals and were effective against the Delta variant, among others. These fascinating findings appeared in the prestigious Nature Communications journal, where Dina outlined three different mechanisms by which the nano-antibodies neutralize the virus, stop it from infecting additional cells, and thus prevent the onset of COVID-19. Dina and her colleagues conducted a structural analysis of the nano-antibodies, which revealed vital information and opened the door to future vaccines and treatments – which may be effective against existing and future variants!



# Prof. Maya Tamir

Faculty of Social Sciences, Psychology Department

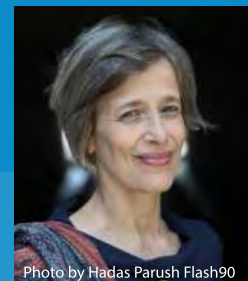


Maya is a pioneer in the field of the regulation of emotions. Her research focuses on how people want to feel and why, and how to harness emotions for individuals' self-benefit. Her research is replete with empirical evidence showing that emotions are central to decision-making, ethical considerations, and other cognitive processes. She work addresses questions about the distinction between emotions and cognition, especially in light of proof that emotions can be cognitively beneficial.

Maya recently ended a successful term as head of the psychology department. She has significantly contributed to both the department and faculty. In addition, during the latest Board of Governors, Maya was awarded the Klatchy Prize for the Advancement of the Frontiers of Science.

# Prof. Ruth HaCohen (Pinczower)

Faculty of Humanities Musicology Department



Ruth has conducted research into a wide range of topics relating to Western and Jewish music. She focuses on music's role in designing and reflecting broad cultural and political processes and contexts. Ruth works a lot on the contribution of music to the history of emotions, questions of music and religion, society, and politics, and Jewish music. Her seminal book, *The Music Libel Against the Jews*, won the Otto Kinkeldey Award from the American Musicological Society, as well as the Polonsky Prize for Creativity and Originality in the Humanistic Disciplines.

Ruth is a paragon of academic leadership and public activity. She is the Artur Rubinstein Professor of Musicology, has served on the National Library of Israel's Board of Directors since 2018, and has been a member of the Van Leer Institute's Board of Governors since 2016.

Ruth was awarded the 2022 Rothschild Prize in the Humanities. In 2017 she was named an honorary member in the American Association of Musicological Society, "for her outstanding achievements in musicology."

# Dr. Rana Eseed

Paul Baerwald School of Social Work and Social Welfare

Rana researches the role of religion in the study of social phenomenon, both on the personal-family level and on the community-political level. She delves into the role of religion in the formation of social-religious organizations, in juvenile delinquency, in mothers of young children, in the interface between social workers and their clients, and more. Her findings have been published in the leading academic social work and social policy journals. In addition, she conducts historical research into social organization and the welfare state. She's currently exploring the welfare system that served the Palestinian population pre-1948 – a topic that has been entirely overlooked in the literature. Her findings will contribute to our understanding of the welfare state, then and now.

Alongside her research, Rana dedicates her time to promoting higher educational to minorities and, in particular, to Palestinians. As a student, she ran the Hebrew University's Unit for Equal Opportunities for Arab Students. Today, she continues these efforts, in terms of both social activities and her research. Rana is a young faculty member who was hired immediately upon returning from her post-doctoral studies abroad. She has faced numerous challenges: Doing a post-doc alone with a small baby, career challenges faced by many young women, and being an Israeli Muslim.



Photo by Bruno Charbit

# Prof. Keren Weinshall

Faculty of Law

Keren is an innovative young researcher, whose creative and interdisciplinary approach has contributed to her reputation in Israel and abroad. She uses clever, empirical methods to examine judicial rulings and the activity of legal institutions. Her findings have been published in leading journals, including the Journal of Empirical Legal Studies and PNAS.

Keren, along with Prof. Lee Epstein, has developed the first public, big data database of nearly 50,000 rulings delivered by the Israeli Supreme Court. She was named a member of the Israeli Young Academy of Arts and Sciences, and has received many awards, including the Cheshin Award for Academic Excellence in the Field of Law and the Gorny Prize for a Young Researcher in Public Law.



Photo by Nati Shohat Flash 90

# Dr. Neta Shlezinger

Koret School of Veterinary Medicine,  
Robert H. Smith Faculty of Agriculture, Food and Environment



Neta is a young faculty member, appointed to the Koret School of Veterinary Medicine two years ago. Her interdisciplinary research looks at the pathogenesis of fungi and the reciprocal relationship between pathogenic fungi and the immune system, by deciphering their mechanisms. On one hand, she studies how pathogenic fungi overcome the immune system's defenses and cause disease and, on the other hand, how the immune system recognizes and defends the body from such fungi. Neta has an exceptional number of publications (including an article in *Microbial Cell* from her doctoral research and an article in *Science* from her post-doctoral research).

She received numerous prizes attesting to her excellence during her post-doctoral studies at Memorial Sloan Kettering in New York. She has also received a number of competitive grants, and is currently working on an ERC grant proposal. Neta runs a prolific lab, and has created a unique course for graduate students on flow analysis.

# Dr. Katy Margulis

School of Pharmacy, Faculty of Medicine



Katy is pharmacist and chemist, notable for her groundbreaking research and imaging of drugs within tissue. She began her academic career at the Hebrew University and continued with doctoral studies at the Casali Center for Applied Chemistry on the Edmond J. Safra campus. During her doctoral research, she developed a method for quickly turning low-solubility materials into easily soluble nano-particles.

Katy conducted her post-doctoral studies at Stanford University. There she developed unique imaging methods for exploring physiological processes in living tissue, which she applied to the identification of pathological changes in tissue and developing new therapeutic targets for drugs. She continues to use these methods in her lab, extending their application to the smart development of drug delivery methods by measuring the distribution of drugs within the tissue, tracking its metabolism, and mapping physiological changes that accompany the treatment.

Since joining the faculty of the Hebrew University, Katy has served on the team that established the University's Metabolism Center, which serves many different research units.

# Prof. Yifat Prut

Edmond & Lily Safra Center for Brain Sciences

Yifat studies the motor system of macaques, showing how communication between numerous parts of the brain underlie their planning and execution of motor activities.

Yifat's studies demonstrate how the "little brain" (cerebellum) is involved in the planning, regulating, learning, and timing of voluntary actions, and attempt to decipher the neural mechanism used to influence the cerebral cortex – in order to develop future treatments for brain damage (e.g. stimulation). Recently she has published in leading academic journals, and just this past year promoted to full professorship. Yifat also sits on various important University committees.



Photo by Maxim Dinshteyn

# Prof. Nathaly Kravchenko-Balasha

Faculty of Dental Medicine

Nathaly is a top-notch researcher who joined the Faculty of Dental Medicine's Institute for Biomedical Research six years ago. Since then, she has established a leading research group and been awarded many competitive research grants and prizes.

Nathaly combines theoretical and experimental approaches to study cancer. One of her main projects is examining the molecular differences between cancer patients or cells within their tumor, and "translating" this difference into quantitative parameters that can predict the cells' reaction to different therapies – enabling doctors to treat their patients with tailor-fit drug combinations.

Nathaly and her research group successfully applied this method in a few types of cancer, including melanoma, lung cancer, breast cancer, and mouth cancer. New of their achievement was duly noted in industry, and led to the establishment of MEDPNC, a company that Nature Research named as one of the top 40 innovative, academia-based companies worldwide.



Photo by Nati Shohat Flash90

# Prof. Nathalie Balaban

Racah Institute of Physics

Nathalie is one of the most prominent biophysicists worldwide. Her research focuses on identifying key problems in biological systems, where biophysical approaches can offer added value, and developing experiments that provide precise quantitative information and then applying diverse and effective physical and mathematical analysis. Using this approach, Nathalie has surprised the scientific community time and time again, as she shows that the complex behavior of biological systems (such as bacteria) is often rooted in few-parameter mechanisms that can be expressed as non-linear mathematical equations, which are often typical of complex physical systems.

Nathalie's groundbreaking studies have appeared in the prestigious academic journals, and she had been awarded competitive awards and grants (including two ERC grants). Globally, she is considered a leader in the field of biophysics.

Beyond her academic work, Nathalie dedicates much time to fostering diversity at the Hebrew University. She founded and runs the Teacher-Scholar program, and sits on committees dealing with research, education, and the academic administration of the University.



# Prof. Tanya Zion-Waldoks

Seymour Fox School of Education

Tanya has been teaching at the Hebrew University's Seymour Fox School of Education since 2019. Her research explores the intersection between gender, religion, and politics – with an emphasis on education and social change.

Using qualitative and comparative methods, she studies women who are working to improve the status of women in traditional societies and diverse religious groups (religious, ultra-Orthodox, Muslims, etc.) In addition, she studies gender equity education and women's activism to combat racism in Israel. She has published in leading journals, including an article that was given an award from the Israeli Sociology Society. She earned her doctorate in Gender Studies from Bar-Ilan University, where her research focused on Israeli agunot (women whose husbands refuse to grant a gett).

She conducted post-doctoral studies at Princeton University and the Ben-Gurion Institute for the Study of Israel and Zionism at the Ben-Gurion University of the Negev. These posts were made possible by a number of prestigious research grants, including a Rothschild Fellowship (Yad Hanadiv), the Israel Science Foundation, a Kreitman Fellowship, and a Fellowship from the Israel Institute. She lives in the Negev and is the mother of four children.



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# No More Painful Biopsies

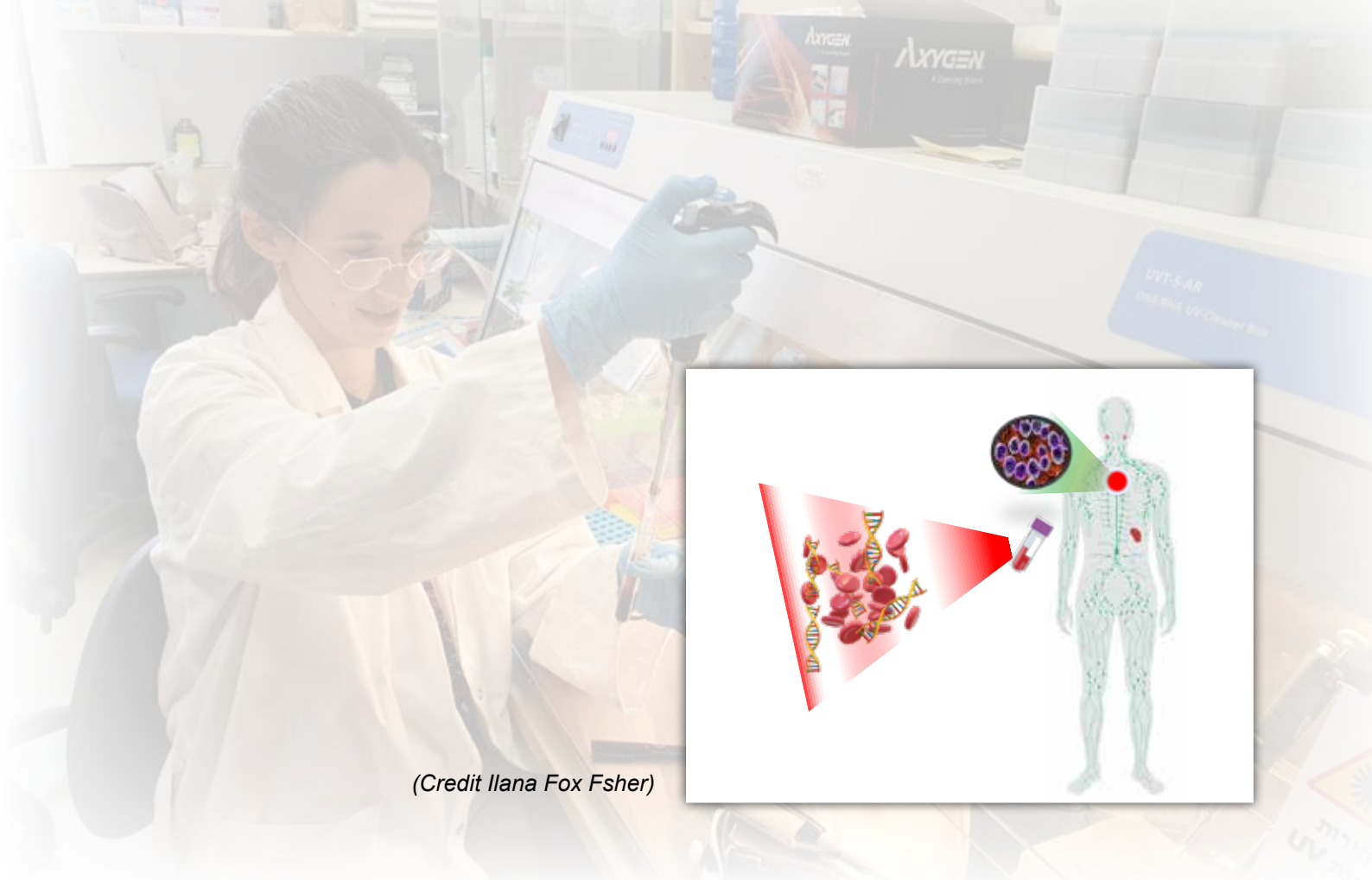
Blood Test Developed at Hebrew U. Detects Immune and Inflammatory Activity in Tissues, Removing Need for Painful Biopsies and Expensive Imaging



*Hebrew U Ilana Fox Fisher (Credit Hebrew U)*

Our immune systems work hard to keep us healthy and to protect us against bacteria, viruses, fungi, parasites and cancerous cells. When our Immune systems are weakened, we are at risk of illnesses and dangerous infections; when they are overactive, we are at risk of inflammation and autoimmune diseases. Therefore, accurate monitoring of our immune systems' activity is vital to our health.

Currently, the main way to test our immune system's health is a blood test that counts immune (white blood) cells in the body. If the number comes out higher than normal, it may mean there is an infection in the body that the immune system is fighting off. However, these blood tests often fail to catch immune system activity in the body's remote tissues, such as those found in bone marrow, lymph nodes and



*(Credit Ilana Fox Fsher)*

other organs. In those cases, patients must follow-up with invasive measures, such as biopsies and expensive and potentially harmful imaging modalities such as PET/CT scans and MRI's and even then, such advanced testing doesn't always detect the problem.

Now, a group of scientists, led by Hebrew University of Jerusalem (HU) MD/PhD student Ilana Fox-Fisher and Professor Yuval Dor at HU's Institute for Medical Research-Israel Canada (IMRIC) has developed a novel method to monitor remote immune processes within those remote tissues and organs. The work, published recently in eLife, relies on two fundamental biological principles. First, dying cells release fragments of DNA into the blood stream. Second, the DNA of each cell type contains a unique chemical pattern called methylation.

Based on these principles, scientists can identify from which tissue the circulating

fragments of DNA originated and infer disease states. For example, if a patient is battling breast cancer, there will be an elevation of DNA fragments (which is deposited into the blood stream after a cell dies) originating from breast cells and carrying the methylation hallmarks of breast cells, ditto for cardiac DNA fragments during heart attacks. "These methylation markers allow us to monitor human immune cell dynamics, and provide important information that isn't accessible in standard blood cell counts," explained Dor. "This novel tool can illuminate healthy and pathologic immune processes taking place deep within tissues, which are not accessible at present," he added.

As part of their work, the researchers identified the specific DNA methylation patterns among immune and inflammatory cells types. This helped them detect DNA fragments deposited into the blood stream when those immune cells died. "A key finding is that immune-derived ►►



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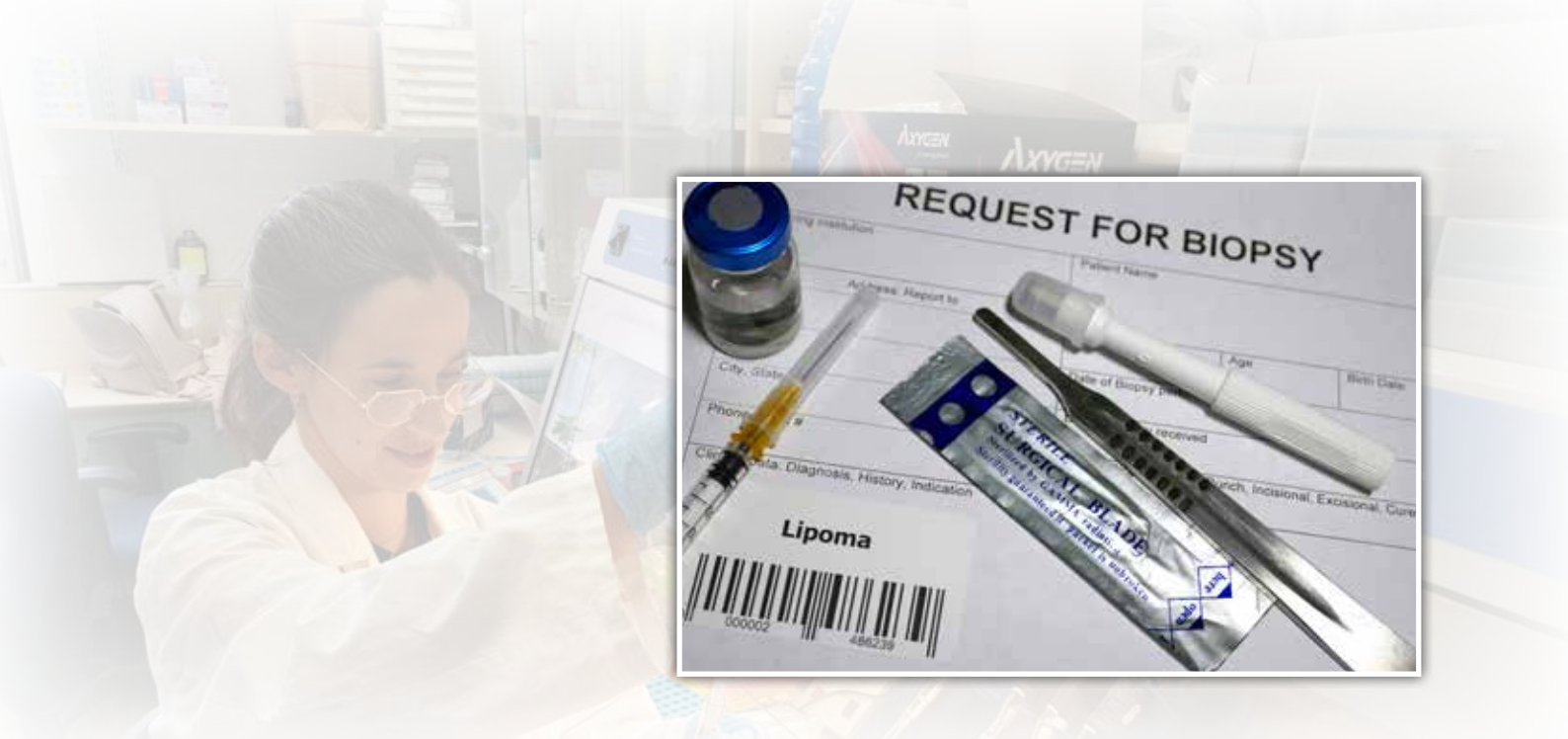
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►► DNA fragments are not a simple reflection of circulating blood cells, but rather an accurate report of immune processes happening in the body,” explained Fox-Fisher. “Our research suggests that, in principle, doctors could monitor remote but critical immune processes by measuring the immune battle’s casualties, that is, immune-derived DNA fragments circulating in patients’ blood.”

The researchers tested their theory and found proof of concept by testing several medical conditions where the immune system is activated but standard blood cell counts are normal. The first was with eosinophilic esophagitis (EoE), a chronic allergic disease that affects kids and adults and is often difficult to diagnose. To date, EoE diagnoses require invasive endoscopic biopsies because most patients’ blood counts come back normal. However, probing further, Dor’s team found that EoE patients’ blood contains abnormally high levels of DNA fragments from eosinophils (as identified by their unique DNA methylation pattern). “Our new non-invasive blood test could go a long way in helping diagnosis and monitoring this disease,” added Fox-Fisher.

The team found similar success with lymphoma, a type of cancer that usually does

not show up in blood tests. However, the new blood test does pick up DNA fragments left by the immune system’s fight with lymphoma, without the need for bone marrow aspiration and further imaging. Currently, Fox-Fisher is conducting a study of people who have been vaccinated against COVID-19 to see whether the levels of DNA released from antibody-producing B-cells increased after they received the vaccine.

“We’re hopeful this new blood test will give clinicians a more accurate picture of the state of their patient’s health, beyond the standard blood counts which often do not tell the whole story and frequently necessitate invasive follow-up tests and biopsies,” concluded Fox-Fisher.

**Remote immune processes revealed by immune-derived circulating cell-free DNA. Ilana Fox-Fisher, Sheina Piyanzin, Bracha Lea Ochana, Agnes Klochendler, Judith Magenheim, Ayelet Peretz, Netanel Loyfer, Joshua Moss, Daniel Cohen, Yaron Drori, Nehemya Friedman, Michal Mandelboim, Marc E Rothenberg, Julie M Caldwell, Mark Rochman, Arash Jamshidi, Gordon Cann, David Lavi, Tommy Kaplan, Benjamin Glaser, Ruth Shemer, Yuval Dor. *eLife* 2021;10:e70520 DOI: 10.7554/eLife.70520**

# Nano Medicine and Drug Delivery

Nanomedicine has huge potential in personalized medicine in cancer and at the Hebrew University, ground breaking research is being conducted under Professor Ofra Benny and her team.

Professor Benny has been a faculty member at the Institute of Drug Research, Faculty of Medicine, School of Pharmacy at the Hebrew University since the beginning of 2013. Her multidisciplinary lab focuses on developing novel therapies and drug-delivery systems based on nanotechnology and functional biomaterials. By studying key processes in the tumor microenvironment and employing an integrative approach that combines bioengineering, nanomedicine and theoretical models, her lab designs selective nanotherapies to provide maximum drug efficacy with minimum side effects.

Using novel methods for controlling the fabrication of drug carriers, along with computational analysis the lab developed tools to design and optimize therapy in cancer per specific property of patient own cancer cells. Prof. Benny's research revealed an important link between the mechanical properties of cancer cells (e.g cell stiffness and deformability) and their ability to interact with nanoparticles.

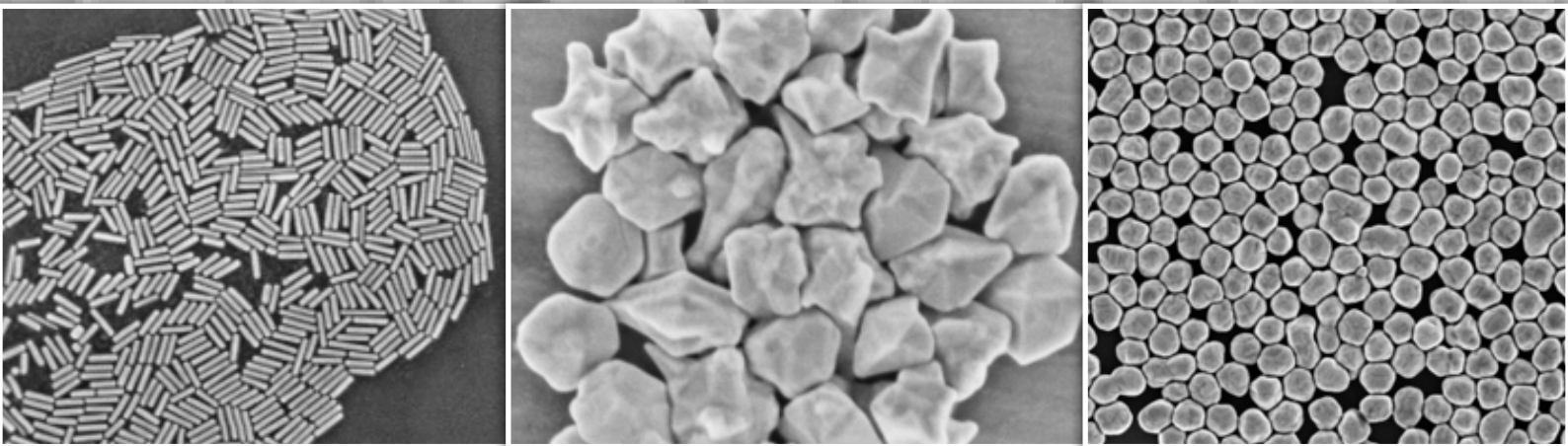
In order to allow maximal treatment of cancer cells by nanoparticles it is critical to control the physical parameters of the nanoparticles such as their size, shape and rigidity. For that Benny's lab developed small devices to efficiently load drugs in distinct particles with fine control.



*Professor Ofra Benny (credit D Guthrie)*

A further important technology being developed in Benny's lab is related to personalized therapy in cancer using "Tumor on a Chip". Patient samples are disintegrated and reconstructed in a 3-dimensional way and grown on a small, few centimeters de

Nanomedicine has huge potential in personalized



*Examples of gold nanoparticles fabricated in the lab.*

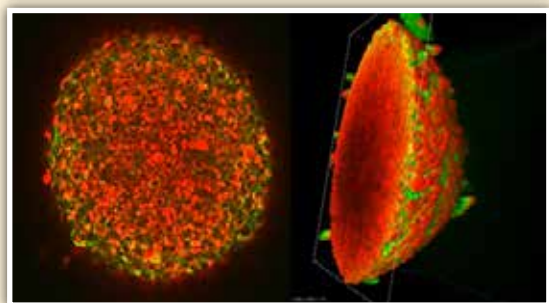
medicine in cancer and at the Hebrew University, ground breaking research is being conducted under Professor Ofra Benny and her team.

vice. In the chip the samples can be treated with various drugs and nanoparticles and predict tumor response to therapy. Artificial Intelligence is used to reveal important biological patterns which make it possible to translate in order to predict important clinical outcomes.

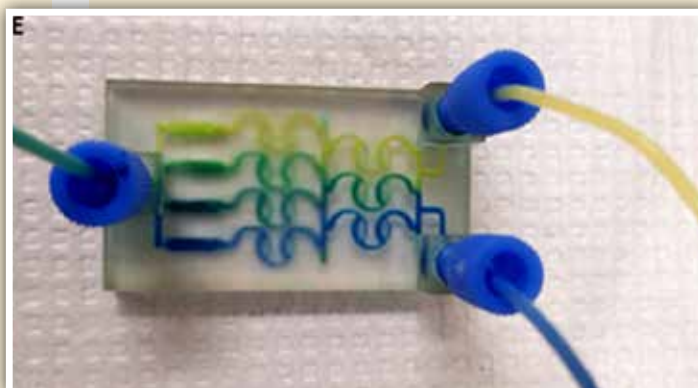
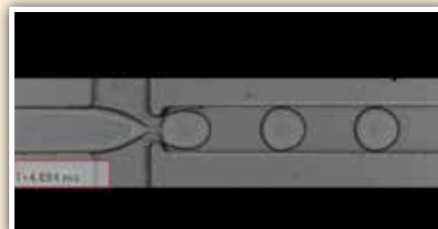
Before joining the Hebrew University, Professor Benny earned her PhD from the Technion in Biotechnology Engineering. Upon her graduation at the end of 2006, she began her postdoctoral studies at Harvard University's Boston

Children's Hospital under the mentorship of the late Prof. Judah Folkman, a pioneer of the field of angiogenesis, the formation of blood vessels. This unique expertise in cancer biology on the one hand and on the engineering concept on the other hand is the basis of the current work in her lab at the Hebrew University that allows for these disciplines to converge in order to better provide solutions for personalized medicine.

*Examples of 3D tumors grown on chip (~300 micrometer)*



*Examples of chips for particle fabrication*



*Tumor on a chip with gradient perfusion chip*

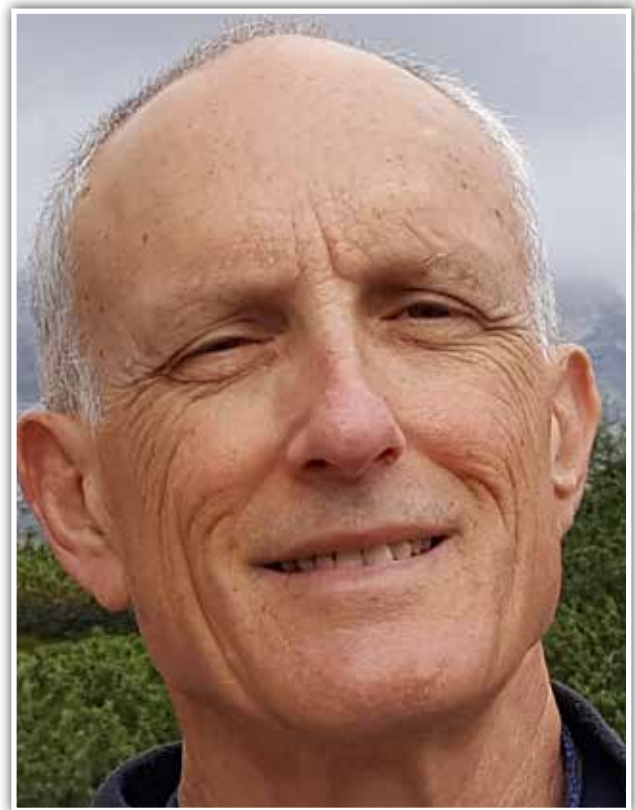
# If It's In The Air - and Our iPhones - It'll End Up In Our Bones

Lead Found in 12,000 Year Old Skeletons Reflects Increasing Rates of Lead Production, Toxic Exposure and a Harbinger of Things to Come, Hebrew University Study Finds

In our increasingly industrialized world, what we produce “out there” has a direct impact on what happens in here, inside our bodies. A new study by Hebrew University of Jerusalem (HU) reveals the link between rates of metal production and toxic lead exposure in humans. The research team closely examined human remains from a burial ground in central Italy that was in consecutive use for 12,000 years.

They found that as worldwide lead production began and increased, so, too, did the rates of lead absorption found in people who lived during those time periods—even those not remotely involved in lead production—simply by breathing the air around them.


This observation of the toxic effects of metal pollution has wide-reaching implications for



*Professor Yigal Erel credit Hebrew University*

public health given the forecasted increase in production of lead and other metals to keep up with manufacturing demands for electronic devices, batteries, solar panels and wind turbines, among others.

Professor Yigal Erel at Hebrew University



*Aerial view of the Palazzo della Cancelleria, the cemetery has been dug in the central courtyard*

of Jerusalem (HU)'s Institute of Earth Sciences led the study, along with HU colleagues Prof. Liran Carmel, Adi Ticher and Ofir Tirosh, as well as, University of Vienna's Ron Pinhasi and Sapienza University of Rome's Alfredo Coppa. Their findings were published this week in Environmental Science and Technology.

We often think of lead in terms of paint and pipes. However, lead production has its own rich history, beginning several millennia ago. A big boost in lead production began 2,500 with coin production, an uptick that reached its peak during the Roman Period before declining during the Middle Ages. Beginning 1,000 years ago, lead production was on the rise again, prompted by silver mining in Germany, then in the New World, and finally to meet the demands of the Industrial Revolution.

While increases in lead production rates are noted in our environmental archives, such as glaciers and sediments from lakes, lead concentrations in human bones and teeth seldom told the ►►



*Excavation in 1992, under the floor of the oldest church, primary burials begin to appear*

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*Dr. Michaela Lucci. 1992 excavation of the collective grave*



*Excavation of 1992, under the floor of the oldest church, some primary burials appear*

►► outside story of worldwide lead production rates, until now. As part of their research, the scientists analyzed bone fragments from 130 people who lived in Rome, from as early as 12,000 years ago—well before the advent of metal production—until the 17th century. By analyzing the elemental composition found in their bones, the researchers were able to compute the level of lead pollution over time, and showed that it closely mimicked the rate of worldwide lead production.

“This documentation of lead pollution throughout human history indicates that, remarkably, much of the estimated dynamics in lead production is replicated in human exposure. Thus, lead pollution in humans has closely followed their rates of lead production,” explained Erel. “Simply put: the more lead we produce, the more people are likely to be absorbing it into their bodies. This has a highly toxic effect,” Erel shared.

Aside from the history lesson in lead production rates, exposure from our earlier times is a harbinger for the health effects of lead production for our ever-industrializing world today and in the future. Studies have shown that toxic lead exposure in people, especially in children, takes place through diet, air-pollution and urban soil resuspension. Alongside these concerns, we’re

seeing an ever-mounting demand for metals in the manufacturing of electronic devices. “The close relationship between lead production rates and lead concentrations in humans in the past, suggests that without proper regulation we will continue to experience the damaging health impacts of toxic metals contamination,” Erel warned.

While those most directly affected by these dangers are people with the highest exposure to lead, namely miners and employees in recycling facilities, lead can be found throughout our daily lives in the form of batteries and the new generation of solar panels that deteriorate over time and release their toxicity into the air we breathe and the soil from which we grow our crops. “Any expanded use of metals should go hand in hand with industrial hygiene, ideally safe metal recycling and increased environmental and toxicological consideration in the selection of metals for industrial use,” Erel concluded.

***Lead in archaeological human bones reflecting historical changes in lead production.***

***Yigal Erel, Ron Pinhasi, Alfredo Coppa, Adi Ticher, Ofir Tirosh, Liran Carmel, DOI: 10.1021/acs.est.1c00614***

# Always Look on the Bright Side of Life

## Hebrew University Research Finds Optimism Extends Life Expectancy Among Seniors

Happiness might lead to better health but does it help you live longer? That's a question that researchers at Hebrew University of Jerusalem (HU) took on in a longitudinal study they began back in the 1990s. They looked at the impact of optimism on longevity and found that maintaining a positive outlook can directly extend your life. Professor Jochanan Stessman, Director of HU's Institute on Aging led the study, along with HU's Prof. Jeremy Jacobs and Dr. Yoram Maaravi. They published their findings in *The Journals of Gerontology*.

The data is based on HU's "Jerusalem Longitudinal Study". The long-term study followed 1,200 elderly Jerusalemites who were born in 1920 or 1921 and analyzed their health, ability to function, economic wellbeing, social skills, anxiety level, integrity and optimism. Optimism was measured through questions about participants' positive experiences and expectations for the future.

"Our findings indicate that optimism has an impact on survival, whereas other studies have shown that it improves health-related functions, such as our immune systems, reducing risk factors for high blood pressure and cardiac issues, and maybe even cancer," said Maaravi.

In addition to the one-on-one interviews, the researchers looked at participants'



*Dr Yoram Maaravi credit Hanan Schwartz*

medical and, later, death records and factored in parameters such as gender, economic status, marital and parental status, education levels, physical and social activity, among others.

Once they had all the data, the team determined that there was a correlation between a positive

outlook and a longer life, and found clear evidence that elderly participants (aged 85-90) with a high optimism score had a 20% higher rate of survival over those who were less optimistic. This number jumped to 25% in the 90+ age bracket. The study also found that men, in general, were more optimistic than the women were.

In countries with large, aging populations, a better understanding of those factors that contribute to a long, healthy life is crucial. “Optimism doesn’t have to be viewed as a trait we’re born with, but one that we can develop,”

shared Maaravi. “It’s important to think of ways to increase optimism because it’s more clear than ever that it can help people at all stages of their lives.”

**Jeremy M Jacobs, MBBS, Yoram Maaravi, MD, Jochanan Stessman, MD, Optimism and Longevity Beyond Age 85, The Journals of Gerontology: Series A, 2021; glab051, <https://doi.org/10.1093/gerona/glab051>**

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## HEALING THE WORLD



According to the World Health Organization, some three-quarters of the world's population has no access to ultrasounds, X-rays, magnetic resonance images and other crucial medical imaging technology. Responding to human need, scientists at the Hebrew University have made it possible to transmit medical images via the humble mobile phone, bringing expert diagnoses to even the most remote corners of the world.

Also at the Hebrew University, many of the world's greatest scientific minds are working together across disciplines and uniting their areas of expertise to achieve a deeper understanding of the human body – their insights are leading to life-saving discoveries. Interaction between basic scientific research and its clinical applications is a University hallmark, with such collaborations leading to the development of a treatment proven to ameliorate the symptoms of Parkinson's disease as well as approved drugs to treat Alzheimer's disease (Exelon) and cancer (Doxil). Other initiatives, such as inhibitors of head trauma, epilepsy and cancer plus advances in artificial limb control are in advanced stages of development. Imagine what is next.

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# Is Shaming or Giving Kids the Silent Treatment Effective?

The Answer Depends on Parents' Religiosity Level,  
Surprising Hebrew U. Study Finds

What do you think is the best way to raise children? One method is psychological control where parents attempt to improve their children's behavior by making them feel shame or guilt about their actions. Another form of psychological control is the "silent treatment", where parents ignore their kids following bad behavior in order to discourage future undesirable behavior. These methods may sound excessively strict and it's often assumed that they will have a negative impact on a child's social behavior – for example, making them less willing to help or to care for other people.

However, researchers at the Hebrew University of Jerusalem (HU) have revealed a more complex picture. Studies led by Professor Maayan Davidov at HU's Paul Baerwald School of Social Work and Social Welfare have shown that a child's response to such stern discipline can depend on the religious commitment of the parent. Her research, in collaboration with Maya Oren-Gabai and Dr. Islam Abu-Asaad, assessed the social behavior of children aged between 6 and 12 years old in 300+ secular and religious Israeli Jewish and Muslim families. The findings were published in *Child Development*.

The results showed that in secular Jewish families, mothers' use of psychological control did appear to have a negative effect on their kids, making them less likely to help others. However, in religious Jewish families, there was no such "cost" to this parenting style. Furthermore, in



*Professor Maayan Davidov (Credit Hebrew University)*

religious Muslim families, this style of parenting actually appeared to have a positive effect: it was associated with more helpful behavior on the part of the child, while among secular Muslims there was no discernible effect either way.

For the purposes of this study, more than 315 parents filled out a detailed questionnaire to assess their religiosity level, parenting style, and use of psychological control in everyday situations. Their children were then given tests

to assess their social behavior, especially their willingness to help a stranger with the simple task of picking up paperclips that had been “accidentally dropped” by a lab assistant.

“It is important to bear this mind,” shared Davidov, “when providing parenting programs and guidance to parents – parenting behavior doesn’t work in the same way in different cultural and religious contexts. For example, what is detrimental in one context may not be harmful in another context.”

According to Davidov, these findings are consistent with the theory that in religious families, parents’ psychological control of their children is driven by a system of values. These values are understood by parent and child, it’s accepted that parents know what is best for their child’s development and that children are obligated to respect their parents and the religious values they bestow. In contrast, however, when parents exert psychological control in a secular context, they are acting in a way that is inconsistent with larger secular cultural values of autonomy and self-direction.

In such cases, shaming and guilt-tripping on the part of the parents is likely viewed by the child in a negative light and as expressions of hostility or rejection which may undermine kids’ positive social development.

Davidov is planning follow-up research to investigate parental behavior that promotes empathic behavior in their children. “I want to connect the dots,” says Davidov, “so that we can better understand why parental behavior can have different consequences in different families.”

***Maayan Davidov, Maya Oren-Gabai, Islam Abu-Asaad, Religiosity as a moderator of the links between parental psychological control and children’s prosociality, Child Development. 2021;00:1–15. DOI: 10.1111/dev.13678***



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# Optimising Water Use In Agriculture



*Dr Yair Mau  
with Laura Rez*

In 2019 Laura Rez arrived at the Hebrew University's Robert H. Smith Faculty as a summer research fellow. She was finishing her B.Eng in Bioresource Engineering at McGill University and wanted to gain hands-on research experience. She spent the summer contributing to modelling the reversal of soil degradation caused by high salinity in irrigation water in Dr. Yair Mau's lab. A few months later, she boarded a plane, made aliya, and began a master's in Environmental Quality Sciences under the supervision of Dr. Mau.

Laura's research focuses on the hydraulic status of trees – how trees use and distribute their water – and the drastic effect of drought in this field. By inserting special sensors within the trunks of orange and mango trees in the Smith Faculty

orchards, Laura has access to real-time data on the inbound and outbound flow of water – and, by extension, the amount of water that each tree holds at any given moment. Tweaking the irrigation can simulate extreme climate events – such as periodic or prolonged drought.

To supplement her data, Laura uses soil sensors and a meteorological station, which provide additional data about the micro-climate in the orchard. To analyze her findings, Laura is writing an algorithm that relates the external environmental conditions (e.g. temperature, humidity) to the inner water status of the tree, to identify the climatic conditions that can bring the tree to its most vulnerable water state. This helps her to discover how the climate, on the smallest scale, impacts the tree over time.



Drilling holes in the stem for the sap flow sensor

Taking a core sample from the stem to check for any abnormalities in the tree that affect its hydraulic architecture, such as disease/rot. In the future, as water stress is applied to the trees, core samples will also be taken to quantify the percentage of irreversible damage to the xylem.



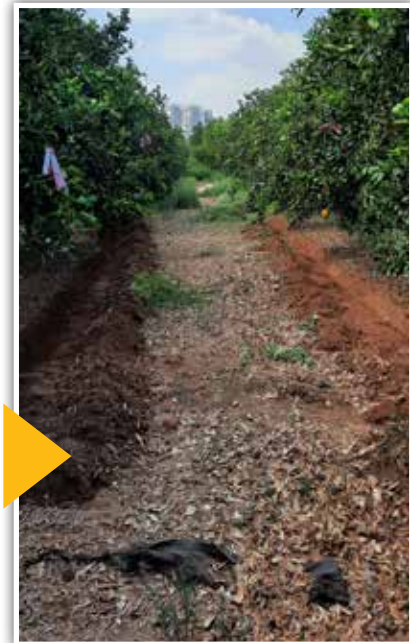
All sensor cables and the solar panel cable were buried underground to prevent damage from the passing tractors and foot-traffic of fruit-collecting workers.



The station was placed within the area of the test trees to measure the microclimate of the orchard.



The East 30 sap flow sensor



*“I feel that I’m in the right place. Israel is the best place for developing sustainable agricultural practices, as can be seen, for example, by the extensive development and adoption of desalinated water in farming – not to mention, as well, the open-mindedness of farmers towards smart-agriculture. It’s also possible for me, at the Hebrew University, to build the network of multidisciplinary advisors and mentors who can help to ensure that we develop the best solutions and truly optimize water use and quality in agriculture!”*

Looking forward, Laura hopes to transfer to the direct PhD track to further develop her research. Ultimately, she hopes to pinpoint the effect of climate change within the long life of agricultural trees, helping farmers optimize their water use throughout the years while maintaining the quality of their produce.

Farmers can then be better prepared as to how and when to intervene – to produce crops, make a living, and save their trees from irreparable damage.

# A Way In

Newly-Identified  
State in Bacteria  
Has Major  
Implications  
for Antibiotic  
Treatment and  
Resistant Strains



*Professor Nathalie Q. Balaban and PhD student Yoav Kaplan*

For more than two years, newsfeeds have kept us updated on the daily battle to annihilate the coronavirus. So, it's easy to forget that there are also many types of bacteria threatening human health – our survival depends on the constant quest for new antibiotics that can destroy them. Recent research provides an important insight into the complex response of bacteria to antibiotics and opens up the possibility of developing a novel and more effective class of drugs to combat major bacterial diseases.

Antibiotics fall into two categories: bactericidal drugs that kill the bacteria and those that are bacteriostatic. The latter disrupt the bacteria's normal functioning so they can no longer multiply, leaving our immune system to provide the final lethal blow. Both

antibiotics push bacteria to a near-death state before their final elimination. Under this life-threatening stress, according to research at the Hebrew University of Jerusalem (HU), led by Professor Nathalie Q. Balaban and PhD student Yoav Kaplan, bacteria enter a “disrupted” state when they function very differently from normal bacteria. The breakthrough findings were published in *Nature*.

When the stress is removed, the bacteria do not fade away and die, but eventually recover and reproduce – with each individual cell behaving in a different way from its genetically identical neighboring cells. While in the ‘disrupted’ state, the bacteria do not respond to our current armory of antibiotics, which have only been designed to treat bacteria in

their normal state. “Bacteria in the disrupted state require treatment that is different from our current arsenal of antibiotics,” shared Balaban. “We’re now beginning to research new pharmacological agents that can defeat bacteria during the disrupted state.”

While bacteria are single-celled organisms, they are extraordinarily complex. Like single cells within any organism, they are capable of self-regulating when subjected to various stresses. For example, if you increase the temperature, bacteria will produce proteins that protect the cell from heat. Restrict their intake of nutrients and the cells will adapt so that the cell can survive and regrow when the nutrients become available. Many of these responses have been analyzed and the mechanisms adopted by the cell are well understood. However, when the stress is sudden and severe these responses don’t kick in and the mechanisms controlling the behavior of cells remains a mystery.

Balaban’s team had previously shown that a subpopulation of bacteria will enter a frozen or dormant state when subjected to starvation and will eventually, in a nutrient rich environment, recover completely and regrow. These “persistent” bacteria are very different from “resistant” bacteria, which have developed a genetic mutation that stops them succumbing to a particular antibiotic. Further, despite extensive research, there is no clear understanding of the mechanisms controlling persistence.

In order to develop a model that can predict the behavior of bacteria experiencing dramatic near-death conditions, Balaban’s team investigated the behavior of individual cells of a strain of E.coli – bacteria commonly used in lab experimental work. Wild variants of this bacteria can cause serious gastrointestinal infections with life-threatening complications. The thriving cells were given a dose of a chemical (SHX) that immediately induces starvation. This acute stress, like a large dose

of antibiotics, doesn’t allow the cells to set in motion an adaptive response.

The SHX was applied for different lengths of time in separate experiments. After withdrawal of the SHX, the recovery of single cells was observed. The cells did not all recover at the same rate, which one might expect in genetically identical cells. Instead, some cells recovered quickly—within an hour—while others took much longer, sometimes up to a day. The length of recovery time also depended on how long the initial dose of SHX was applied for, although there was a maximum dose beyond which any increase in the time of application of the SHX had no effect on the recovery times of the bacteria cells.

Balaban explained that “this suggested that the bacteria keep a memory of the total exposure to SHX.” The rates of recovery clearly showed that the process was not random. In fact, they seemed similar to the rates seen in certain physical processes that show recovery after an external stress has been removed, seen, for example in some plastics. By using this analogy, the Balaban group, together with HU professor Oded Agam, an expert in statistical physics, were able to model the disrupted state and predict the behavior of populations of cells in this state. Importantly, this model enables prediction of how a bacterial population will respond to an antibiotic treatment.

According to Balaban, a better understanding of bacteria’s disrupted state “opens new avenues for the development of better treatments which will enable killing not only the bacteria in their normal state, but also when they enter the elusive disrupted state.” Looking ahead, similar effects may be exploited to kill cancer cells more effectively.

**Observation of universal “ageing” dynamics in antibiotic persistence. Kaplan Y. et al. Nature 2021 DOI: 10.1038/s41586-021-04114-w**

# Siege Ramps and Breached Walls:

## Ancient Warfare and The Assyrian conquest of Lachish

Back in the day, the Assyrians were one of the Near East's superpowers, controlling a land mass that stretched from Iran to Egypt. They accomplished this feat with military technologies that helped them win any open-air battle or penetrate any fortified city. While today, air power and bunker busters help win the war, back in the ninth to the seventh centuries BCE, it was all about the siege ramp, an elevated structure that hauled battering ramps up to the enemy's city walls and let the Neo-Assyrians soldiers wreak havoc on their enemies.

Constructed in Israel, the Assyrian siege ramp at Lachish is the only surviving physical example of their military prowess in the entire Near East. Now, for the first time, a team of archaeologists has reconstructed how the Assyrian army may have built the ramp and used it to conquer the city of Lachish. The team, led by Professor Yosef Garfinkel and Dr. Madeleine Mumcuoglu of the Institute of Archaeology at the Hebrew University of Jerusalem (HU), and Professors Jon W. Carroll and Michael Pytlik of Oakland University, USA, drew on a rich number of sources about this historical event to provide this complete picture. The outstanding amount of data includes biblical texts (2 Kings 18:9–19:37; 2 Chronicles 32; Isaiah 36–37), iconography (stone reliefs depicting Assyrian battle scenes) and Akkadian inscriptions, archeological



*Prof. Yosef Garfinkel. Hebrew Unievrnsity*

excavations, and 21st century drone photographs. They published their findings in Oxford Journal of Archaeology.

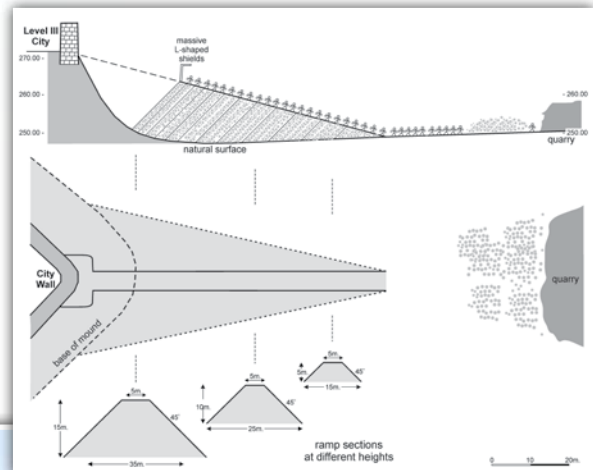
Lachish was a flourishing Canaanite city in the second millennium BCE and had been the second most important city in the Kingdom of Judah. In 701 BCE Lachish was attacked by the Assyrian army, led by King Sennacherib. Garfinkel's analysis provides a vivid account of the construction of the massive ramp that was built by the Assyrians so that they could haul battering rams up to hilltop city of Lachish, breach its walls, and totally overrun the city. There have been several conflicting views on how the formidable task of constructing the ramp was achieved. However, the rigorous method employed by Garfinkel and his team,

including photogrammetric analysis of aerial photographs and creating a detailed digitally map of the relevant landscape, produced a practical model that accounts for all available information about that battle.

The Assyrians had a mighty and well-equipped army that, in the early eighth century BCE, rapidly quelled growing rebellion in the Southern Levant. In 721 BCE the Kingdom of Israel was conquered. Twenty years later, the Assyrian army attacked the Kingdom of Judah, laying siege to its most important city, Jerusalem, and launching a direct assault on its second most important city, Lachish. King Sennacherib himself went to Lachish to oversee its destruction, which began with his army building a ramp to reach the walls of the hilltop city.

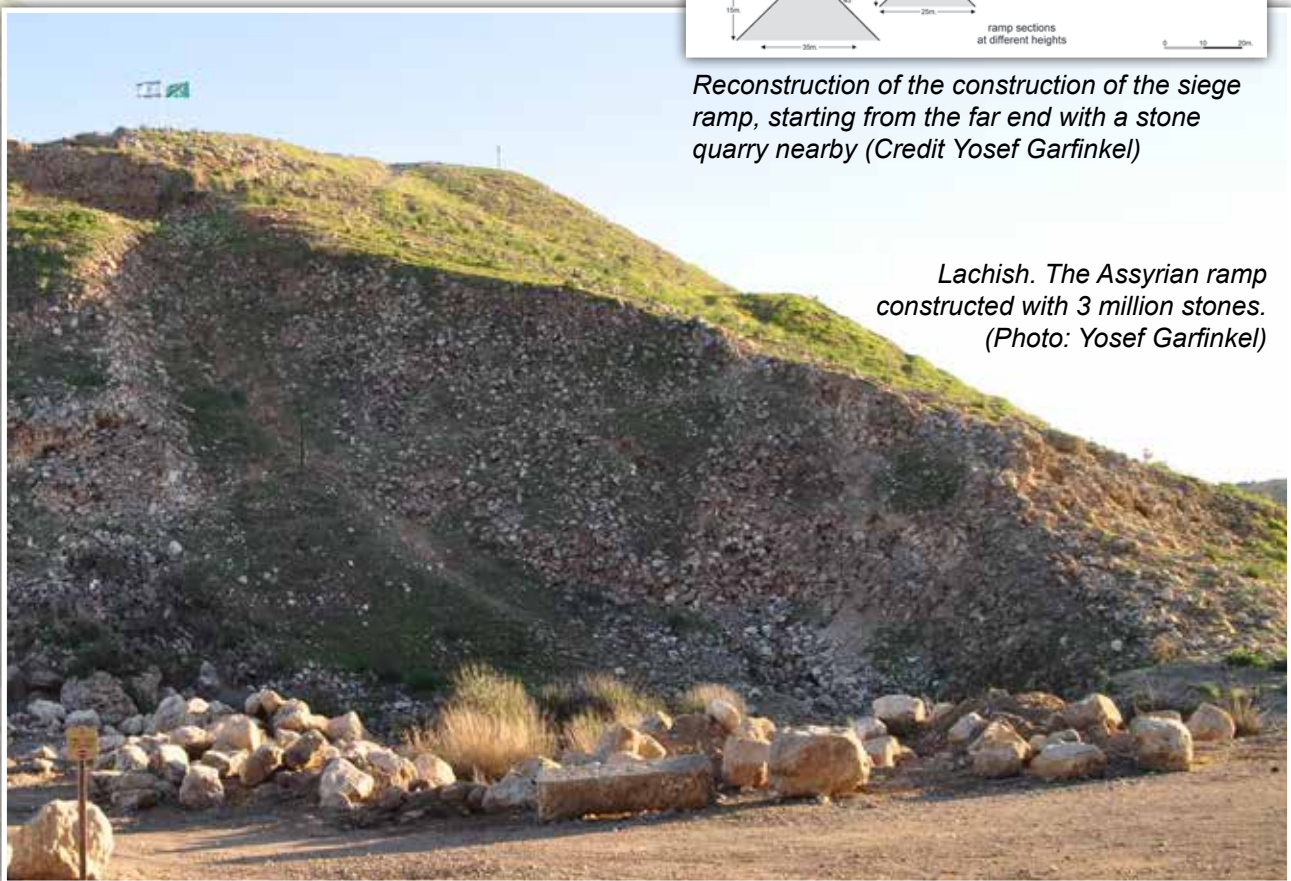
According to Garfinkel, evidence at the site makes it clear that the ramp was made of small boulders, about 6.5 kg each. A major problem

faced by the Assyrian army was the supply of such stones: about three million stones were needed. Where did these stones come from? Collecting natural field stones from the fields around the site would require a great deal of time and would slow the construction of the ramp. A better solution would be to quarry the stones as close as possible to the far end of the ramp. “At Lachish there is indeed an exposed cliff of the local bedrock exactly at the point where one would expect it to be,” Garfinkel shared. ▶▶



*Reconstruction of the construction of the siege ramp, starting from the far end with a stone quarry nearby (Credit Yosef Garfinkel)*

*Lachish. The Assyrian ramp constructed with 3 million stones. (Photo: Yosef Garfinkel)*





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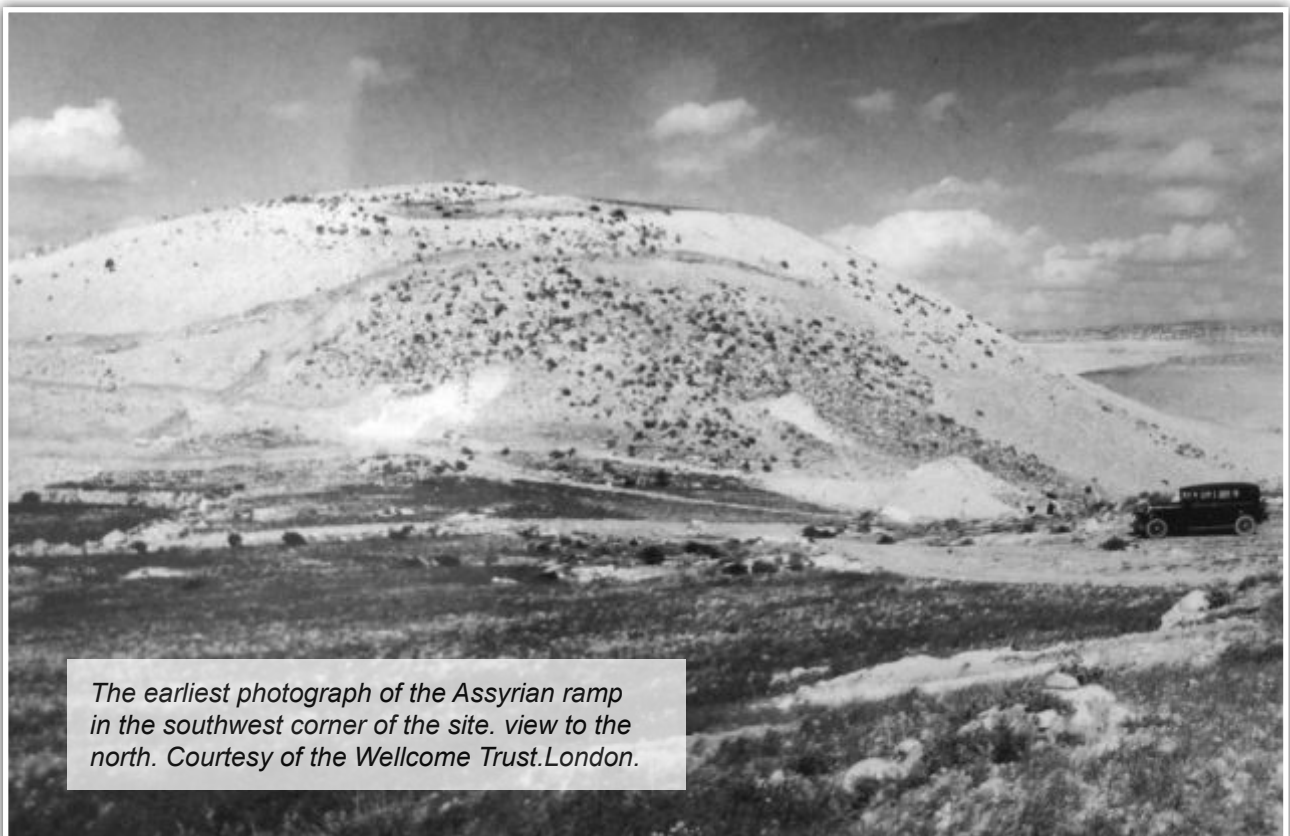
►► The research suggests that its construction began about 80 meters away from the walls of the city of Lachish, close to where stones required for the ramp could be quarried. The stones would have been transported along human chains –passed from man-to-man by hand. With four human chains working in parallel on the ramp each working round-the clock shifts, Garfinkel calculated that about 160 000 stones were moved each day. “Time was the main concern of the Assyrian army. Hundreds of laborers worked day and night carrying stones, possibly in two shifts of 12 hours each. The manpower was probably supplied by prisoners of war and forced labor of the local population. The laborers were protected by massive shields placed at the northern end of the ramp. These shields were advanced towards the city by a few meters each day,” described Garfinkel.

In about 25 days, the ramp, which was the



*Siege scene with two massive L-shaped shields protecting Assyrian soldiers, in a relief from the palace of Tiglath-Pileser III at Nimrud (courtesy of the British Museum)*

shape of a giant triangular wedge, could have reached the city walls. “This model assumes the Assyrians were very efficient, otherwise, it would have taken months to complete,” said Garfinkel. Indeed, the prophet Isaiah,



*The earliest photograph of the Assyrian ramp in the southwest corner of the site. view to the north. Courtesy of the Wellcome Trust.London.*

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who lived at the end of the eighth century BCE and was an eyewitness to the events, mentioned the Assyrian army in some of his prophecies. He relates to the Assyrians as a mighty, supernatural power, “None of them tired, none of them stumbling, none of them asleep or drowsy, none of them with belt unfastened, none of them with broken sandal-strap.” (Isaiah 5:27).

As the workers built the final stages of the ramp and approached the walls of Lachish, the inhabitants would try to defend their city by shooting arrows and throwing down stones on their enemy. Garfinkel suggests that the workers used massive L-shaped wicker shields, similar to those shown protecting soldiers on Assyrian reliefs. In the final stage, wooden beams were laid on top of the stones, where the battering rams within their massive siege machines, weighing up to 1 ton, would be securely positioned. The ram, a large, heavy

wooden beam with a metal tip, battered the walls by being swung backwards and forwards. Garfinkel suggests that the ram was suspended within the siege engine on metal chains, as ropes would quickly wear out. Indeed, an iron chain was found on the top of the ramp at Lachish.

To get further confirmation, Garfinkel explains that he is “planning excavations in Lachish, at the far edge of the ramp in the quarry area – this might give additional evidence of Assyrian army activity and how the ramp was constructed.”

**Yosef Garfinkel, Jon W. Carroll, Michael Pytlik, Madeleine Mumcuoglu, Constructing the Assyrian siege ramp at Lachish: texts, iconography, archaeology and photogrammetry. Oxford Journal of Archaeology. <https://onlinelibrary.wiley.com/doi/full/10.1111/ojoa.12231>**



*The six locations on the Assyrian siege ramp where stones were retrieved and weighed. (Credit Dr. M. Pytlik)*

# Would You Like Some Heavy Water With Your Coffee?

Hebrew U. Researchers Decipher  
the Sweet Taste of Heavy Water

A long-standing, unresolved puzzle concerns the taste of heavy water. Regular water has no distinct taste but rumors indicate that heavy water tastes sweet. Why is this so if heavy water, D<sub>2</sub>O, is practically identical to ordinary water, H<sub>2</sub>O?

A team of scientists, led by Professor Masha Niv at Hebrew University of Jerusalem's Institute of Biochemistry, Food Science and Nutrition and Pavel Jungwirth at the Czech Academy of Sciences, found answers to these questions using cell-based experiments, human subjects, mouse models and molecular dynamics simulations. Their research was published in *Communications Biology*. They found that heavy water tastes sweet to humans but not to mice, and this "taste" is mediated by humans' sweet taste receptor.

Heavy water differs slightly from normal water. It is called "heavy" because of the 10% additional density it has when compared to hydrogen. It also freezes and boils at slightly higher temperatures than does regular water. How do these minor physicochemical differences contribute to such a difference in taste?

To answer this question, the team conducted heavy water taste tests with people and with mice. Participants received 3 samples of water—two were ordinary water and the third was heavy water. They were asked to sniff the water, then to taste the water while their noses



*Professor Masha Niv (Credit Hebrew University)*

were closed with clips, and finally to sip the water without nose clips.

The findings: heavy water could be distinguished from regular water based on taste alone. Further, heavy water tasted sweeter than ordinary



water to humans, but not to rodents. When the researchers added lactisole, which inhibits sweet taste receptor T1R2/T1R3, to the heavy water sample, it decreased the sweet taste for humans and blocked the activation of sweet taste receptor at the cell-level. This demonstrated to the researchers that the sweet taste receptor T1R2/T1R3, which is activated by sugars and artificial sweeteners, is also activated by heavy water.

While you won't find a bottle of heavy water near the cinnamon and almond milk at your local Starbucks anytime soon, "a better understanding of our sweet taste receptors may lead to new ways of eliciting sweet sensation, without the added sugar," shared Niv.

These findings may have future implications in the medical field, as well. The fact that heavy water elicits responses of our sweet taste receptors is significant since those receptors are not only located on our tongues but in other tissues, as well. Further, added Niv, "our sweet taste receptor belongs to a very important family of receptors called GPCRs. GPCRs are important drug targets and deeper insights into their activation mechanisms may deepen our understanding of this useful family of proteins".

**Ben Abu, N., Mason, P.E., Klein, H. et al. Sweet taste of heavy water. *Commun Biol* 4, 440 (2021). <https://doi.org/10.1038/s42003-021-01964-y>**

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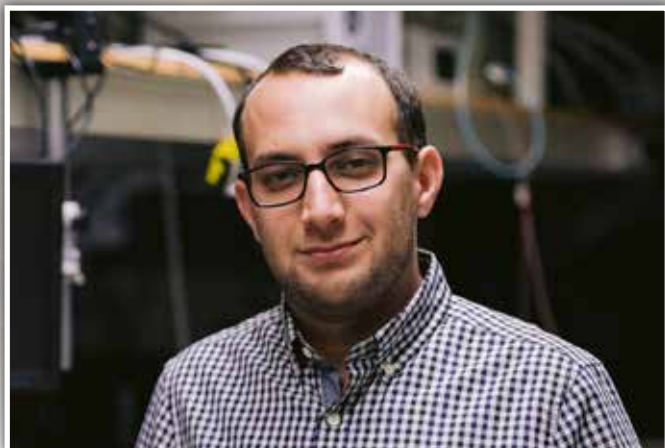
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# Keeping Data Secure On The Internet

## Quantum Encryption Advances at Hebrew U



*Hamza Abudayyeh (Credit Yitz Woolf)*



*Ronen Rapaport (Credit Yitz Woolf)*

Quantum computers will revolutionize our computing lives. For some critical tasks they will be mind-bogglingly faster and use much less electricity than today's computers. However, and here's the bad news, these computers will be able to crack most of the encryption codes currently used to protect our data, leaving our bank and security information vulnerable to attacks. Currently, most computer security relies on mathematical manipulations that, at present, ensure a very high level of security—it would take a regular computer billions of years to break one of those codes. However, in our quantum future, new methods of encryption that rely on the laws of physics, rather than mathematical equations, will need to be developed.

One fruitful approach is to use the quantum properties of single photons (particles of light) to securely encrypt a message so that any

attempt to hack it is immediately detectable by both the sender and recipient. However, getting a suitable source of single photons has been an immense challenge. Now, a team of researchers, led by Professor Ronen Rapaport and Dr. Hamza Abudayyeh of the Racah Institute of Physics at the Hebrew University of Jerusalem (HU), together with Professor Monika Fleischer, Annika Mildner and others at the University of Tübingen in Germany, has achieved a significant breakthrough. Their findings bring us closer to a simple and efficient method of quantum encryption, and were published in the recent edition of ACS Nano.

Banks and government departments are already investing heavily in quantum encryption that relies on laser beams. However, laser beams often release several photons at once or none at all. What is needed for optimum security is



*Conceptual (Credit Lars Lüder)*

*Rapaport Lab  
(Credit Yitz Woolf)*

a source that can emit a fast but steady stream of single photons—in one direction and at room temperature.

The team at HU developed a system that uses fluorescent crystals in the form of specks so tiny that special microscopes are needed to see them. Known as quantum dots, each dot measures much less than a thousandth of the width of a human hair. A laser beam shone at the quantum dot causes it to fluoresce and emit a stream of single photons.

These quantum dots are individually mounted on golden pinheads – except, of course, it is a nano-pinhead, or nanocone, almost a hundred thousandth the size of a regular pinhead. Nanocone are able to increase the quantum dot emission of photons 20-fold. This stream of photons is then shot off in a single direction by a ‘Bragg grating’ acting as a type of antenna.

The HU-Tübingen device is not only useful for quantum encryption, but in other situations that rely on quantum bits to encode information, such as quantum computation. “At present, we have a good prototype that

has the potential for commercialization in the near future,” shared Ronen Rapaport.

The advantage of quantum cryptography lies in its physical determinism. “Laws of science cannot be broken—a single photon cannot be split, no matter how hard one tries. Mathematical complexities might be very difficult to solve, however they are vulnerable to attack and breaches unlike quantum-based security systems,” explained Hamza Abudayyeh. The team is currently improving their device so that it can provide an even more reliable and efficient stream of single photons that could be used in a wide range of quantum technologies. Stay tuned.

With thanks to the Hebrew University’s Center for Nanoscience & Nanotechnology and Quantum Information Science Center.

**Hamza Abudayyeh, Annika Mildner, Dror Liran, Boaz Lubotzky, Lars Lüder, Monika Fleischer, and Ronen Rapaport, Overcoming the Rate-Directionality Trade-off: A Room-Temperature Ultrabright Quantum Light Source, doi.org/10.1021/acsnano.1c08591**



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# Australia-Israel Cooperation in Science

A new program funded by the  
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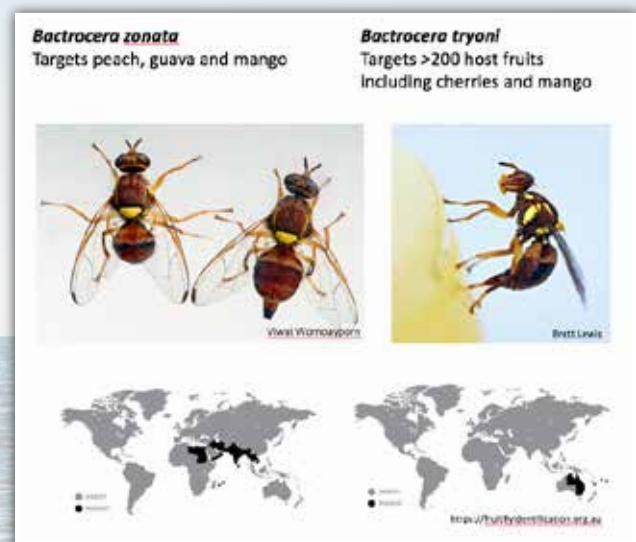
The ZCAI was established in 2021, when a long-lasting global pandemic had done much to curtail international cooperation in science. It continues the work of the Sir Zelman Cowen Universities Fund which, for over 40 years had established a tradition of support for research and scholarship at the Hebrew University of Jerusalem and at one of Australia's oldest universities, the University of Sydney.

The ZCAI advises the Education Heritage Foundation, based in Sydney, on the support of scientific projects at the HUJI and at Australian universities (including Sydney), on the support of student and academic exchanges and on the award of an annual Prize for Discovery in Medical Research

Recently (2021) the ZCAI launched a call for applications for scientific projects (including medical science), with a preference for projects that involved HUJI-Australian collaboration.

From an unexpectedly large number of applications, 8 projects have been selected for funding (up to AUD\$150,000 each per annum over 2 years) beginning in mid-2022.

The Vice-President for International Affairs of the Hebrew University, Professor Oron Shagrir, welcomed the initiative: "We were taken by surprise, not by the quality of the applications for we know the quality of research here in



Jerusalem, but by the breadth and diversity of the projects. It is a strong re-start to the long history of HUJI-Australian collaboration in science”.

According to Mr Michael Dunkel, a trustee of the SZCUF and a director of Education Heritage Foundation, who has played a leading role in this support of research and scholarship since the beginning of the SZCUF in 1978 “Israel and Australia are as far apart as nations can be, but we share challenges in medicine and agriculture and, in these projects, the safeguarding of coral reefs and the sustainable harvesting from the oceans. Several of the projects are at the forefront of medical science, dealing with human health, which is a concern ►►

►► in every country. The ZCAI Directors welcome this strong return of long-distance but common-problem collaborations”.

#### Protecting Crops with Modern Weapons

An orchard in the sun; a field of wheat; insects harvesting honey from the blooms. It seems like enlightened harmony. But there is a form of warfare between plants and animals that has been going on for millions of years, and two of the projects funded in this round of Israel-Australia projects will develop weapons to tip the war the farmer’s way. And help produce the crops needed to feed the huge current world population.

Such weapons, because they tip the balance of natural struggles, must be carefully targeted, with no collateral damage; and for that scientists have to understand the detail of plant-insect warfare. The two projects are:

Can we protect staple crops from devastating insect herbivores by silencing their Ecdysteroid kinase-like gene family?

Professors Shai Morin (Entomology, HUJI) and Charles Robin (Biosciences, University of Melbourne) will join forces to tackle a white fly infestation that decimates crops of cassava, a staple root vegetable in Africa, Asia and South America. “But” the investigators note “although this is our model, the intervention we are engineering will apply, in principle, to any pest infesting any crop”. Insects have eaten plants and laid their eggs on them for millions of years; the plants have survived because they have evolved toxins – even cyanide – carefully packaged so they poison the insect and not the plant itself; and, in response, insects have developed ways to neutralise these toxins. It has been a long war. The Melbourne and Jerusalem labs believe they have identified the genes that the white fly has evolved to counter the cassava’s toxins; and they have developed understanding of the biochemical pathways involved. They will explore modern techniques of ‘gene silencing’

to stop the ability of the white fly to disarm the cassava plant’s defence. The cassava’s long-evolved toxins will then be able to deal with the infesting flies, and prevent the decimation of the cassava crop.

Safeguarding the Australian and Israeli horticultural industries from fruit fly pests

Drs. Philippos Papathanos (HU) and Simon Baxter (University of Melbourne) will tackle a pest that spoils fruit crops world-wide, the fruit fly. Like the white fly that infests cassava, the fruit fly seeks the fruit as food and as a site for the laying of eggs, so reproduction. The teams’ approach is called an SIT (sterile insect technique); they engineer sterile males flies, and release them in numbers large enough to reduce the local reproduction of flies. Again, the use of insecticides is avoided, with all the collateral damage that insecticides cause; and anyway, flies evolve to be resistant to insecticides.

Previous work has succeeded in breeding sterile males in large numbers for one species of fruit fly, called the medfly, that is particularly problematic. And their release has the desired effect – a large reduction in fly numbers in the area of release.

The progress-limiting step lies in the breeding program – how to separate the sterile males from their sisters. In flies (as in humans) the male/female difference is determined by the presence in males of a Y chromosome, and the teams will use fast DNA sequencing and CRISPR technology to engineer new strains of two fruit fly species, in which the Y-chromosome expresses a feature that enables rapid separation of males from females; so overcoming the progress-limiting step in the deployment of the SIT technique. “It is goal-oriented work” according to the investigators “but it requires new and fundamental understanding of the genome of the fly”. The work will not drive the fruit fly to extinction but it will enable a huge reduction in crop

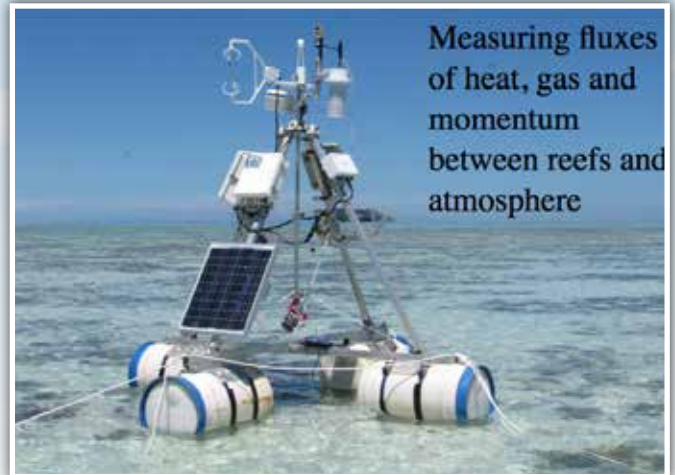
# Understanding our Oceans

Two of the projects funded are in marine biology. Australia is an island with a huge coastline and coastline resources. Israel has two coastlines, both resource-rich. These projects are focussed on fundamental problems of management of the marine environment.

The biophysics of photosynthetic light harvesting and its implications on primary productivity in the ocean

This work will be done by teams led by Drs. Nir Keren (Life Sciences, HU), Yossi Paltiel (Applied Physics, HU) and Paul Curmi (Physics, University of NSW). A fundamental step for life as we know it is the constant harvesting of the sun's energy, on land and in the oceans; with about half of the global harvest achieved in the oceans, by what the investigators describe as 'a dazzling array' of light-harvesting mechanisms.

Their work will be done at molecular and biophysical levels, understanding how radiant energy of the sun – even well below the surface of the sea – interacts with molecules evolved by sea-dwelling microorganisms and plants, so that the energy is recruited to drive the growth of ocean ecosystems. The investigators have already identified specialised antenna on some of these bacteria (called cyanobacteria), which recruit light efficiently at low levels. In 'the field', so at and under the sea, and in the laboratory, they will probe the mechanism of light recruitment in microorganisms, which, as they note, makes the oceans a 'carbon pump' that draws gigalitres per annum of carbon dioxide out of the atmosphere, into long-term storage in the oceans and their sediments. The vigour of that 'marine carbon pump' is critical as we seek to limit climate change driven by the accumulation of carbon dioxide in the atmosphere. And photosynthetic

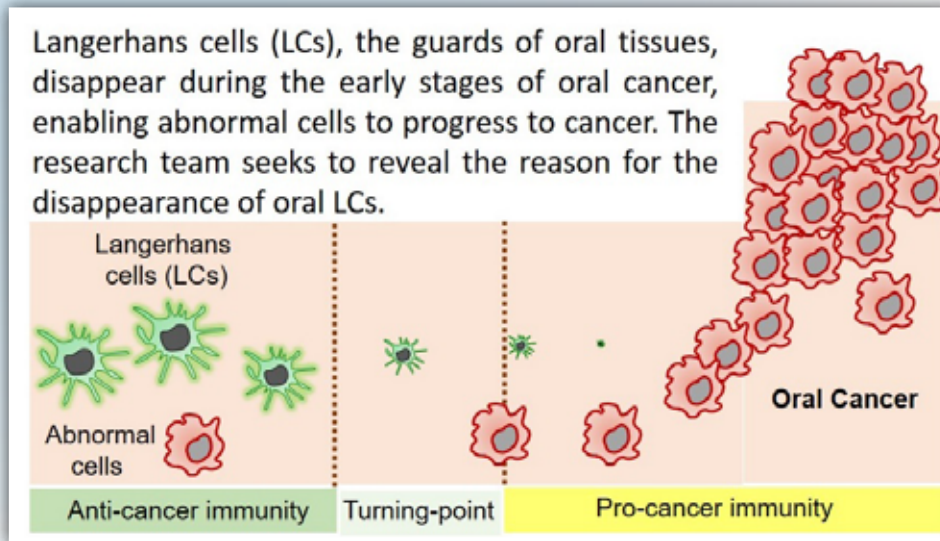


light harvesting is the primary mechanism of the ocean's carbon pump activity. This project is a focussed investigation of a process that must be understood.

From desert to tropical, how do coral reefs react to the changing climate? An air-water interactions perspective

Coral reefs, these investigators note, are the tropical and subtropical rainforests of the oceans. Although they comprise <1% of the oceans, reefs are home to 25% of marine species and half a billion people depend on them. They are rich with life and full of colour; lay people know about them, snorkel in them and photograph them. For scientists seeking to understand climate change, the reefs are where change is obvious. Reefs are studied as places of early warning, as well as for their own intrinsic value.

The work will be done by teams led by Professors Efrat Morin and Nadav Lensky (Earth Sciences, HU and the Geological Survey of Israel); and Hamish McGowan (Earth and Environmental sciences, University of Queensland). These teams have already established a previously ►►



►► unsuspected interaction of reefs and deserts. As they put it, they will test “whether evaporative cooling of surface waters by hot dry desert winds and atmospheric turbidity due to natural aerosols help to protect the fringing coral reefs of the Gulf of Eilat from the full impact of global warming”. They discovered the desert-induced cooling effect in waters off Eilat, on Israel’s southern coast, where the desert comes down to the shore and the reefs have formed just off the beaches; very different from Australia’s Great Barrier Reef, which lies tens of kilometres off a subtropical coast. They will assess this novel finding systematically, over the full range of seasonal winds and currents found in the Gulf. Can desert-coral coastlines show us ways of protecting reefs throughout the world? Or at least serve as areas where current coral species can be best and longest protected?

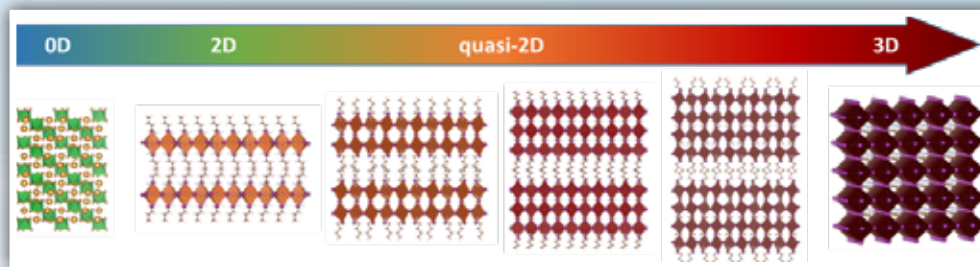
**Human Health:  
The Mission to Reduce Suffering**

Four of the projects are in medical sciences – on the development of the nervous system, the origins of cancer of the mouth and pharynx, the improvement of body imaging and the aetiology of pandemics. Fundamental research always has practical implications.

The cellular and molecular dynamics regulating sequential development of the dorsal spinal cord.

The spinal cord is the part of the central nervous system which extends from the base of the skull along the back (in humans down the back). It runs in a bony canal formed by the arches of the vertebrae, the bones that form the vertebral column and define ‘the vertebrates’, arguably the most successful of the many classes of animal. From mice to elephants, from primitive eels to humans, this body architecture defines a huge segment of animal life.

How does this defining body architecture form? Embryologists have described the anatomy of spinal cord formation down to the cellular level; the process is called neurulation. The skin along the back of the vertebrate embryo somehow (and this uncertainty is the focus of this project) involutes, forming first a groove along the back of the embryo. Then the groove closes, forming a tube, which swells greatly at the head end, to form the brain and shape the head. Along the rest of the body the tube becomes the spinal cord, from which the sensory and motor nerves extend around the body, to provide sensation and motor control. And the formation of the tube seems to trigger the differentiation of surrounding tissues



into the vertebral bones. If those nerves are damaged, or if the spinal cord is disconnected from the brain, we suffer a disabling paralysis and loss of sensation. So the spinal cord is critical to body function; as well as defining our place in the planet's life. The process of neurulation can go wrong, resulting in foetal death or, if the foetus survives, then with damaging outcomes like spina bifida.

Drs. Chaya Kalcheim (Medical Neurobiology, HU) and Quenten Schwarz (Cancer Biology, University of South Australia and SA Pathology) will combine resources to go beyond descriptive embryology, and define the signalling that controls critical stages in neural development. In particular they will study how the neural tube closes to form a tube. The edges of the groove are known as the neural crest and much is known how neural crest cells separate as the groove closes to form a tube and migrate away to form the spinal and autonomic ganglia, and the nerves that connect to peripheral tissues. Less is known of how the remaining cells in the crest region seal over the tube, and form the roof plate of the neural tube. These roof plate cells stay within the spinal cord and establish its circuitry, which is the distributing interface between brain and body. Some of the molecular players are already

known, genes and proteins with names like Wnt and BMP4. The Kalcheim group has recently demonstrated that a third signalling system, retinoic acid, guides the critical closure of the neural tube by suppressing Wnt and BMP genes. More remain to be discovered, and the molecular signals important for defect-free formation of the neural tube (which becomes the spinal cord) have yet to be defined. Also yet-to-be-defined is the temporal sequence of signalling during gestation of the foetus. This work will extend understanding of neural development, from anatomical description to cellular and molecular analysis of one of the defining features of our species.

Elucidating early carcinogenic mechanisms dysregulating Langerhans cell differentiation during experimental oral squamous cell carcinoma

Cancer is the breakdown of what should be robustly stable features of adult tissues – that cells do not mutate, do not multiply (except where they must multiply and then under strict controls) and do not de-differentiate, reverting from stable adult forms committed to a function, to undifferentiated forms which can break out of control. When the stability of adult cells fails,▶▶▶

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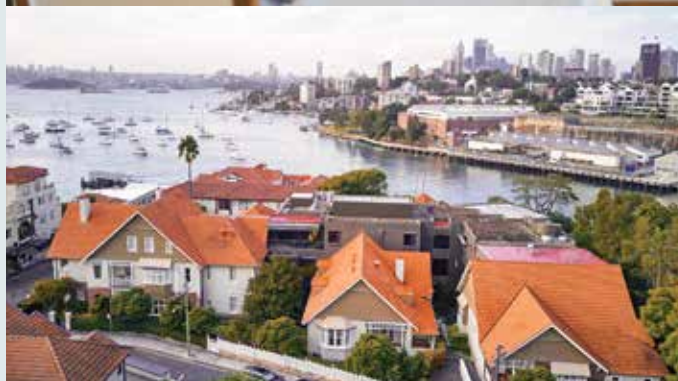
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►► we see cancer – uncontrolled tissue growth that too often kills the sufferer. Remarkably, it is increasingly clear that our immune system, long understood to be our defence against infectious diseases, also plays a major role in the suppression of cancer.

This project seeks to define, in cancers of the mouth and pharynx (oral cancers), the early stages in which abnormal cells evade the immune system, even manipulate it, enabling them to grow and spread uncontrollably. Most of the oral cancers originate in the epithelial cells that line the oral cavity. Clinically, the teams note, oral cancers are very difficult to treat and survival rates are low. The leaders of this project are Professor Avi-Hai Hovav (Faculty of Dental Medicine, HU), and Dr Janin Chandra and Professor Ian Frazer (Diamantina Institute, University of Queensland).

One challenge in the treatment and analysis of any cancer is to detect the earliest stages of disease, before the cancer cells have transformed to uncontrollable forms. While early disease stages are the easiest to treat, they are often symptom-free and effectively invisible to both the clinician and the scientist. The HU and UQ teams bring a background of basic discoveries in oral mucosal immunity and clinical success in other forms of cancer, particularly of cervical cancer, to the analysis oral cancer. They have observed changes in a debris-clearing class of cells found in the oral mucosa, known as Langerhans cells (LCs). These cells are known to be the sentinels of the oral mucosa; that is, when infection or a cancerous process in tissue generates pathological forms, it is the LCs that alert and educate the body's immune system to destroy the aberrant cells. LCs therefore represent the first line of defence in the oral cavity.

The team has studied LCs in detail, identifying what may be a 'turning point' in early changes in the oral mucosa marked by the disappearance of functional LCs. They have shown in laboratory

models that a chemical substance or infection with human papillomavirus (HPV), both known to cause oral cancers, promptly depletes and dysregulates LCs. The team hence hypothesises that the cancer begins with some form of malfunction of LCs, where LCs fail to alert and instruct and even suppress the immune system, allowing cancers to progress aggressively.

The teams will compare the behaviour and function of LCs in both settings of chemical and HPV mediated oral cancers. Their aim is to gain a detailed understanding of the mechanisms that lead to LC malfunction and disappearance, which will enable development of new interventions, to stop precancerous changes from becoming malignant.

As they note, 'this is an unmet clinical need'; oral cancer patients experience severe suffering from their cancers and from the side effects of current treatments. New therapies that can stop cancer progression early are urgently needed.

Modern X-ray detectors based on 2D metal halide perovskites

X-rays have been a staple of diagnosis since Wilhelm Roentgen discovered them in 1895. He showed that X-rays pass through many materials opaque to visible light, including through human tissues. But they are more or less absorbed by different tissues and, carefully engineered, they have provided physicians and surgeons with insight into body structure and disease for generations. X-rays and light are parts of the electromagnetic spectrum and Roentgen's successors (he was a physicist) have deployed electromagnetic energy detectors in a wide range of applications, from medical scanners to solar panels.

MHP semiconductors can be constructed in a range of crystal forms

Dr Ido Hadar (Chemistry and Nanoscience,

HU), Dr. Guohua Jia, (Molecular and Life Sciences, Curtin University and Associate Professor Zongyou Yin (Chemistry, ANU) will combine their expertise in the synthesis and fabrication of novel semiconductors known as metal halide perovskites (MHPs), which were developed for solar panels, to test their suitability for the detection of X-rays. MHPs have, they believe, the sensitivity required for the imaging of human tissues, for which the X-ray dose has to be kept as low as possible; and the ease of manufacture needed for the large size of detectors required in medical projection. They will synthesise MHPs in a variety of forms (nanocrystals, bulk crystals, and poly-crystalline films, and in dimensionalities from single layers to multiple layers to full three dimensions) and will test the suitability of each form for the detection of X-rays. Their work, which is at the cutting edge of detector chemistry, will contribute to the next generation of imagers, which will continue the development of X-rays to diagnose and guide the treatment of disease.

#### Assessing the Effectiveness of Non-Pharmaceutical Interventions for Spatial Containment of COVID-19 using Urban Simulation and Machine Learning

Pandemics are a confrontation between micro-organisms, usually viruses, and the species they infect. All species have their defences and viruses mutate rapidly, occasional new strains able to get past those defences, to infect the host and reproduce there, whatever the suffering and death caused in the host species. For COVID-19, the host species include humans and, in 2022, the impact of pandemics needs little exposition. We have all been through it.

Professor Daniel Felsenstein and Dr Yair Greenberger (Geography, HU) will work with Professor Alexey Voinov (UNSW), Dr Gnana Bharathy (Engineering and IT, University of Technology Sydney) and Firouzeh Taghikhah

(ANU) on ways of optimising and deploying ‘non-pharmaceutical interventions’ (NPIs) to minimise the morbidity and mortality caused in pandemics like COVID-19. NPIs usually involve changes in human behaviour – social distancing, masks, lockdowns, hand-washing. But humans are individually complex; some older and some younger; some closely observant of rules and accepting, while others rail against them. Our societies are also complex, and they vary in physical and psychological resilience. Individuals and governments therefore rely heavily on modellers, scientists who try to understand the ebb and flow of a pandemic and build simulation models to reconstruct what happens in a pandemic, understand the main drivers of change and simulate what will happen under various conditions. Their advice to government is of critical importance.

The HU and UTS teams will develop a simulation model of the COVID-19 pandemic which will incorporate variations within a community. Known in the field as an ‘agent-based model’ it will be trialled in two major cities, Sydney and Jerusalem, as a ‘decision-support tool’, for health professionals and governments. It will provide understanding of how the pandemic might progress under different NPI scenarios (mask requirements, social distancing, work-at-home mandates etc). It will also help improve how such measures are communicated to the public. The teams will incorporate machine learning in the model, so that feedback from real life events can be rapidly integrated into the mechanics of the model, increasing its responsiveness to actual trends. Additionally, they will make a user-friendly version available online. This will aid communities struggling with the present pandemic, and help them lay plans for pandemics to come. Their project has the potential to improve human response to any pandemic, reducing morbidity and mortality and minimising social and economic disruption.

# Just Look Up!

## Hebrew U. Team Finds How Plants Make Aerial Roots

Roots are normally associated with things that live underground, in the damp and the dark. Think of turnips, radishes and yams. However, many plants make their roots above ground. Ivy uses its roots to climb on buildings and the mighty ficus tree uses them to support their large branches. What makes plants form roots in the “wrong place,” so to speak? That would be like us humans sprouting legs from our shoulders.

In a recently published study in the prestigious journal *Science*, Hebrew University of Jerusalem (HU) Professor Idan Efroni and his team found the hidden mechanism that enables aerial roots to happen. By decomposing the stem to individual cells, the team identified the extremely rare cells that, when conditions are ripe, cause roots to grow in the air.

“Superficially, these look like other plant cells which is why they evaded detection for so long,” Efroni explained. “We used new techniques to closely screen thousands of cells, one-by-one. We knew that by finding the cells that can make roots, we would be able to look for the ‘switch’ that turns them on.”

Plants make roots from small organs called meristems. By closely examining these unique cells, Dr. Naama Gil-Yarom, a research associate at the HU lab, was able to catch them in the act of making a meristem and to identify the genes that are active right at the transition point. One gene in particular stood out, and when the HU PhD student Moutasem Omary used



*A ficus tree*



*Tomato Aerial Roots*



HU PhD student Moutasem Omary



Researcher Dr. Naama Gil-Yarom



Prof. Idan Efroni

CRISPR to delete this gene, the plants lost their ability to make aerial roots.

When Efroni and his team studied the genome, they were in for a surprise. Right next to the gene that controlled aerial roots production was a very similar gene. “We recognized it immediately from previous studies as the gene that controls the formation of underground roots,” shared Efroni, “I remember thinking that we have just stumbled upon the central hub that controls root formation.” Indeed, when the researchers disabled all of these genes, the plants could not grow any roots at all.

By tracing the evolution of these genes, the team found that many major crops, such as sweet potatoes, beans, tomato, rice, maize and wheat, share this dual root-control-system. “The ability to make aerial roots is highly advantageous to the plant,” explained Efroni. “In the event that the underground roots are flooded or damaged, the plant can grow aerial roots and survive the assault,” he added. Plants evolved this ability early on and never forgot how to do it.

Nevertheless, what is helpful in nature may actually come as a disadvantage in agriculture.

Many plants are grafted, meaning they have the root system of one plant and the aboveground system of another. This allows farmers to grow plants that are resistant to soil disease. However, if the top part of the graft grows an aerial root, it will bypasses the soil-resistance and make all the effort of grafting useless. However, thanks to Efroni and his team’s discovery, we know which genes to target and can create plants with no aerial roots, making the practice of grafting that much more effective.

Looking ahead, the group plans to modify the DNA code at the root control cluster to make customized above- and below- ground root systems. As Efroni concluded, “here in Israel, to make the most use of the land we’ve got, we need to optimize the way our food crops grow and utilize resources. Doing that is a daunting and complex task, but, step by step, we’re getting there.”

**Moutasem Omary, Naama Gil-Yarom, Chen Yahav, Evyatar Steiner, Anat Hendelman, and Idan Efroni (2022). A conserved superlocus regulates above- and belowground root initiation. *Science* 375: eabf4368. 10.1126/science.abf4368**

# Ever Wonder What A Potato Feels...?

Hebrew U. Develops Bio-Sensor to Detect Early Signs of Plant Stress and Prevent Crop Failures from Worldwide Climate Changes



*Dr Shiloh Rosenwasser*

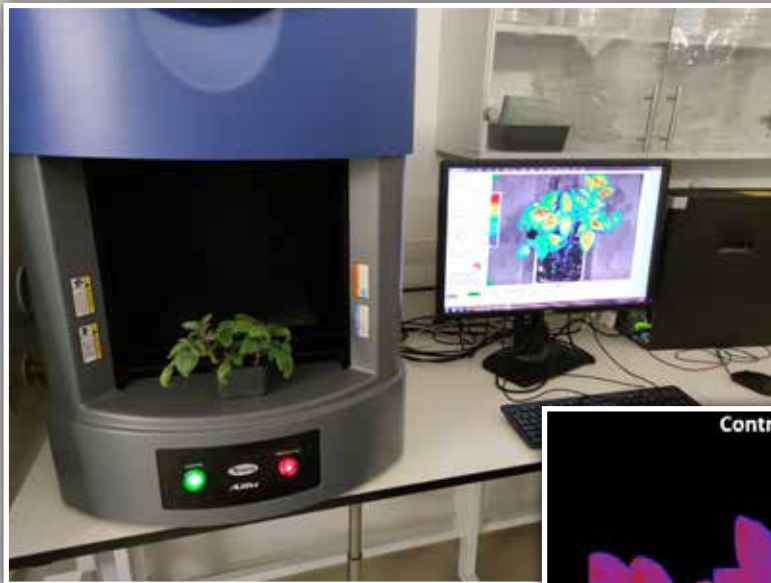
In an effort to increase agricultural productivity and limit waste, a team of researchers from the Hebrew University of Jerusalem (HU)'s [Robert H. Smith](#) Faculty of Agriculture, Food and Environment developed a method to detect signs of stress before the plant is damaged.

Plants are exposed to all types of weather and other external factors that cause harm and impact plants' ability to undergo photosynthesis and produce fruit. If farmers could get an early warning sign that their plants weren't doing

well, this would help them take measures to protect their produce, prevent significant losses and safeguard national food sources.

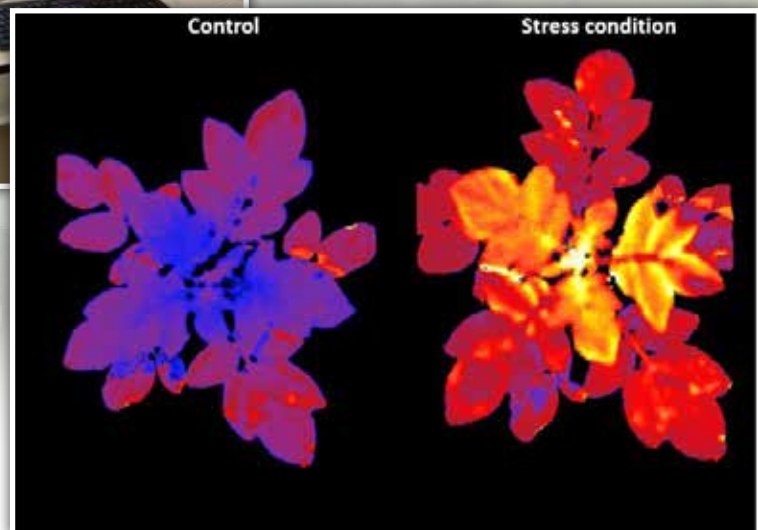
In new research published in *Plant Physiology* by Matanel Hipsch under the direction of Dr. Shilo Rosenwasser at HU's Department of Plant Sciences, scientists have introduced molecular bio-sensors within potatoes that allow for real-time monitoring of stress signals within the plants.

The study's objective was to develop an



*In the lab  
(credit Matanel  
Hipsch HUJI)*

*Imaging of stress  
responses in potato  
plants - courtesy  
Shilo Rosenwasser*



innovative technique that allowed for early detection of stress and under-nutrition without damaging the plant itself. The researchers chose to focus on the humble potato, as a major food crop that comprises 40% of Israel's exports and is crucial for worldwide food security. Known by its Latin name, *Solanum tuberosum*, the potato provides essential nutrients such as dietary fiber, vitamins, minerals, protein, and antioxidants.

By employing genetic engineering, the team introduced a new gene coded to a fluorescent protein that reports the level of reactive oxygen species—highly reactive molecules that when accumulated, signifies stress responses. The biosensor was targeted into the chloroplast, the organelle within the cell responsible for photosynthesis, the chemical process that transfers light into the energy to power plant growth. The researchers were then able to monitor the light emitted from the biosensors and determine the initial phase of plant stress responses.

“By using a fluorescent camera with extremely high sensitivity, we were able to monitor

the fluorescence signals emitted from the biosensors and noticed the accumulation of reactive oxygen species during the early phase responses to stress conditions such as drought, extreme temperature, and high light,” explained Rosenwasser.

Researchers believe the application of biosensors can be expanded to other key crops—an effort that will help stem the tide of food insecurity and crop failures due to climate change worldwide.

**Matanel Hipsch, Nardy Lampl, Einat Zelinger, Orel Barda, Daniel Waiger, Shilo Rosenwasser, Sensing stress responses in potato with whole-plant redox imaging, *Plant Physiology*, 2021;, kiab159, <https://doi.org/10.1093/plphys/kiab159>**

# HU Study of “Lazy Eye” Reveals Public Health’s Blind Spots

A recent Hebrew University study of “Lazy Eye” revealed that an estimated 1% to 5% of children worldwide have lazy eye-- a childhood condition where the vision does not develop properly. It happens because one or both eyes are unable to build a strong link to the brain. It usually only affects one eye, and means that the child can see less clearly out of the affected eye and relies more on the “good” eye. This condition responds well to treatment if begun early on. However, by age 7, if the lazy eye is undiagnosed or left untreated, it can cause permanent visual damage, impair daily activities such as reading, walking or driving safely, and lead to social and financial deficits later on in life.

A team of Israeli researchers, led by Hebrew University of Jerusalem (HU’s) Professor Hagai Levine, Israel Defense Forces (IDF) Medical Corps doctors Itay Nitzan and Maxim Bez, and Dr. Claudia Yahalom from Hadassah Medical Center’s Department of Ophthalmology tracked the prevalence of lazy eye among 1.5 million Israeli teens. In addition to the prevalence of lazy eye among this population, the team found a link between the vision impairment, known medically as amblyopia, and socioeconomic factors. Their findings, were recently published in the *European Journal of Public Health*, and represent the largest population-based study to evaluate the prevalence of lazy eye among teens.

Beginning in infancy, Israeli children undergo several vision screenings to promptly diagnose lazy eye and prevent long-term visual disabilities. All Israeli citizens have state-mandated medical insurance and treatment options at minimal costs are theoretically available to any child who needs them. For the purposes of this study,



*Prof. Hagai Levine (Credit Hebrew University)*

the HU and IDF Medical Corps team analyzed medical records and socioeconomic data of 1.5 million male and female Israeli teens (aged 16.5-18 years) from the years 1993-2017. These are potential military recruits who, when assessing their eligibility for military service, undergo mandatory health checks which include an eye exam, as well as information regarding their socioeconomic status (SES), such as years of schooling, country of birth, family income, and cognitive function scores (CFS).



Photo by  
Nonsap  
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Several key findings emerged from this date. One percent of the teens had lazy eye (14,367 recruits) which is a problem since, at this late age not much can be done to correct the impairment.

That said, the incidence of amblyopia is on the decline: in 1993, 1.59% were diagnosed with lazy eye whereas that figured dropped twofold, to 0.87% in 2017. Second, several characteristics were found to increase the odds of lazy eye, including lower socioeconomic class and scoring lower on cognitive function tests. This connection between socioeconomic factors and lazy eye might stem from a failure of parents to bring their children in for vision screening or to follow-through on the treatment plan. “While the overall prevalence of amblyopia has decreased, being in the lowest socioeconomic status and having below average cognitive function scores increased the odds of lazy eye in both males and females,” Levine explained.

A third finding was a higher (double) prevalence of lazy eye among young men who grew up in ultra-orthodox settings as compared to those raised in secular communities. A fourth, and

intriguing takeaway, was the higher rate of lazy eye among teens born outside Israel compared to those born in Israel. Specifically, immigrants born in the former USSR, North Africa and Ethiopia had a higher incidence of lazy eye, than did immigrant teens from other countries, or Israeli teens born to parents from the USSR, North Africa and Ethiopia.

“We’d like to see changes to Israel’s public health policy, specifically to increase allocations for vision screening and treatment compliance monitoring for those populations vulnerable to developing lazy eye,” concluded Yahalom, sharing that further research is warranted to better understand the barriers that create differences in lazy eye prevalence among various sectors in society.

***Itay Nitzan, Maxim Bez, Jacob Megreli, Dana Bez, Adiel Barak, Claudia Yahalom, Hagai Levine, Socio-demographic disparities in amblyopia prevalence among 1.5 million adolescents, European Journal of Public Health, 1–7. DOI: 10.1093/eurpub/ckab111***

# Elucidating the Brain's White Matter

Novel Method Developed at Hebrew University Reveals Details of Nerve Connections in the Brain



*Dr. Roey Schurr*



*Professor Aviv Mezer*

The human brain is a constant buzz of activity, with its 86 billion nerve cells (neurons) sending electrical signals from one region of the brain to another. The signals travel along the white matter fibers, a maze of wire-like fibers, ultimately giving rise to all brain functions. Uncovering these wire-like highways between neurons has been a longstanding challenge for neuroscience. Existing methods for mapping this neural circuitry at the cellular level are either limited to animal studies or require highly specialized equipment for data acquisition and processing.

Recently, a novel approach for mapping and visualizing these nerve fibers was developed

by Professor Aviv Mezer and Dr. Roey Schurr, neuroscientists at the Hebrew University of Jerusalem (HUJI)'s Edmond and Lily Safra Center for Brain Sciences (ELSC). They utilized a technique that has been around for almost 140 years, but was never used to study the fiber architecture of the brain's white matter. Their findings were recently published in the prestigious journal *Science*.

Neurons themselves have long been studied using the purplish Nissl stain— a stain invented by German medical student Franz Nissl in the 1880s. Its use in staining neurons has revolutionized our understanding of the cortex - the outer gray layer

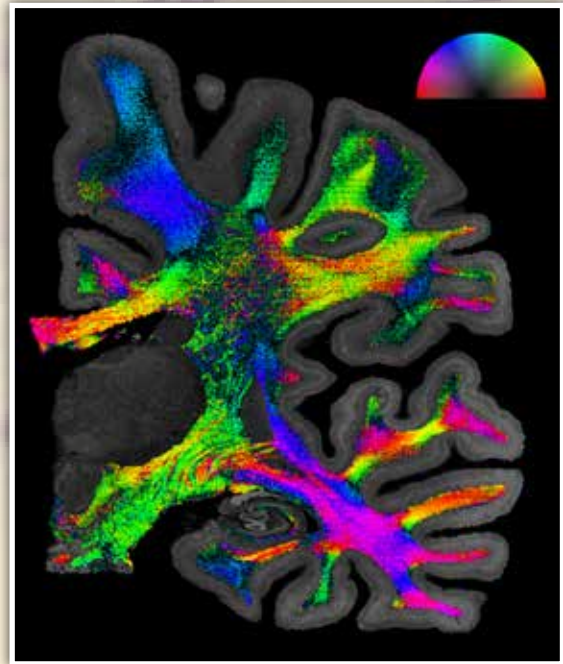
of the brain. However, the Hebrew University team are the first to use Nissl stained brain slices to reveal fiber pathways in white matter.

The white matter is mainly made up of nerve fibers and a group of cells known as glia. These glial cells, until very recently, were largely ignored and thought to be rather unimportant space fillers in the brain – in fact their name “glia” comes from the ancient Greek, meaning “glue”. When Schurr joined Mezer’s lab as a doctoral student, he decided to look at some pictures of Nissl stained brain tissue. “It was just curiosity,” recalled Schurr, “textbooks are full of illustrations, but I wanted to understand what the white matter of the brain actually looked like.”

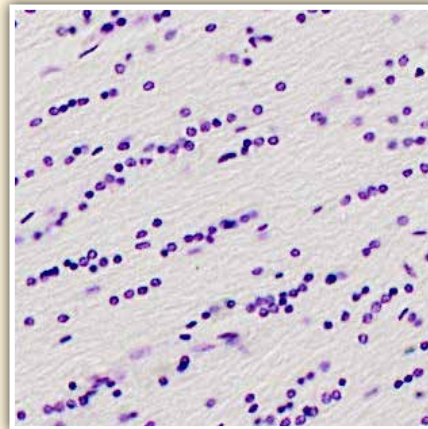
To Schurr’s surprise, he noticed that the glial cells formed a pattern of short rows. Moreover, the glial rows seemed to align with the local nerve fibers. “We did a thorough literature review and found a 1992 paper that already described this glial cell organization,” shared Schurr, “but this finding did not receive the attention it deserved in our field.”

Other research took over, but recently Schurr returned to the unusual observation he had made. The researchers realized that by using simple computational tools from the field of image processing, they could capitalize on the patterned cell organization to uncover the white-matter architecture. “I was amazed when we first applied this technique to a Nissl-stained slice of the brain,” Prof. Mezer said. “In Nissl-stained images, the white matter has a faint homogeneous appearance. Applying some computational tools suddenly brought out a colorful map depicting the fine architecture of white-matter fibers, which was hidden there all along. We immediately recognized it as an important piece of the puzzle that scientists have been searching for in the study of white matter.”

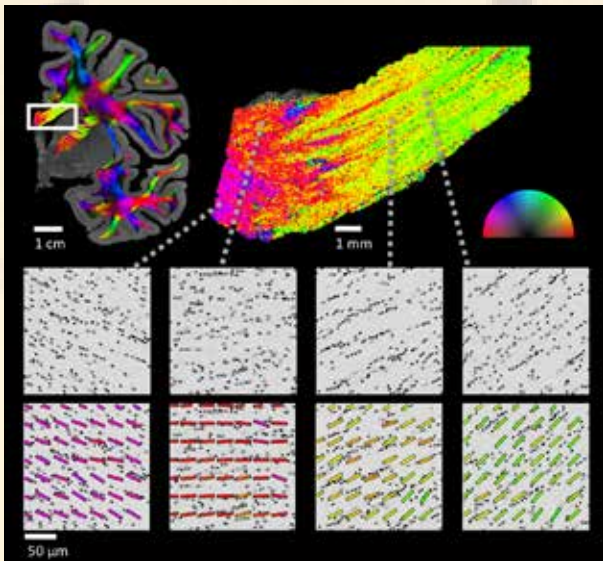
This technique, termed by the Hebrew University researchers as the Nissl-ST (“Nissl-based ▶▶



*White-matter fiber organization calculated at the cellular level. A color-coded orientation map of a single hemisphere of a human brain, reconstructed using Nissl-ST. The colors represent the orientation of glial-rows at each point in the brain, according to the half-circle at the corner. For example, red denotes fibers along the left-right axis, whereas cyan represents fibers along the top-down axis.*



*The glial cell organization reveals nerve fiber architecture. A small section from a Nissl-stained brain sample (200 microns wide). Each filled circle is the stained cell body of a single glial cell. The glial cells tend to form organized rows, whose orientation aligns with the unstained nerve fibers.*



» Structure Tensor”), can be applied to the white matter in any brain slices that have undergone Nissl staining. Since Nissl staining is the most common stain used in brain science, there is much of it to be found all around the world, including digitized datasets and open-source atlases of high-resolution stained brain slices.

“The application of Nissl-ST,” Mezer concluded, “has great potential for future studies of white matter in normal brain development, aging and pathological states that affect white matter, such as neurodegeneration and schizophrenia.”

**Roey Schurr, Aviv A. Mezer, *The glial framework reveals white-matter fiber architecture in human and primate brains. Science (2021).***

<http://science.sciencemag.org/lookup/doi/10.1126/science.abj7690>

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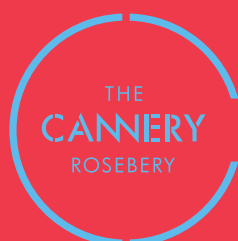
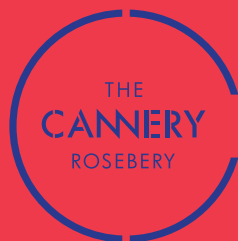
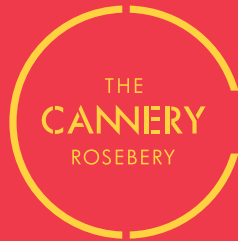
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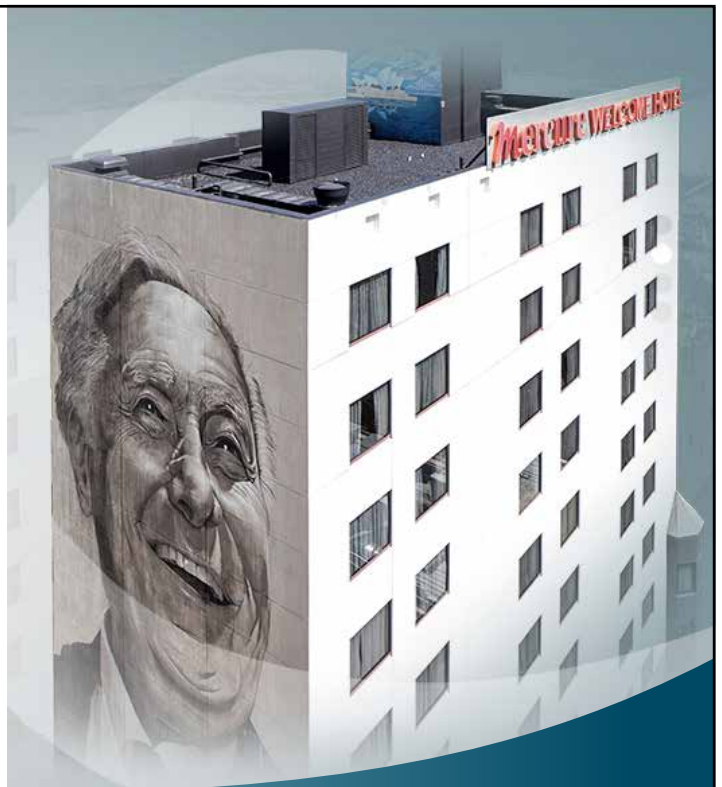
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