



### Climate Change Impacts and Possible Adaptation Strategies for Cyprus

Climate Change will have a diverse effect on different parts of the world. Research at The Cyprus Institute resulting from a host of sophisticated atmospheric and climate models developed at the Energy, Environment and Water Research Center (EEWRC), clearly indicate that the effect will be severe for the Mediterranean basin and in particular its eastern part.

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## Cyprus a Regional Center for High Performance Computing



The Computation-based Science and Technology Research Center (CaSToRC) of The Cyprus Institute will acquire its first major super-computer in 2011. The new acquisition will enable CaSToRC to offer computational services to the Cypriot and wider region's scientific community. It will establish CaSToRC as a regional Center for High Performance Computing (HPC). The development of High Performance Computing capabilities in the Eastern Mediterranean region will serve the need for frontier research applications and will enable scientists to address complex scientific and engineering problems. The first machine will be partially funded with a grant provided by the Research Promotion Foundation's strategic infrastructure program, recently secured by the Institute.

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### Cyl becomes a member of the prestigious ICAM Network

The Institute recently became a member of the Institute for Complex Adaptive Matter (ICAM), providing its scientists global access to new research and educational initiatives, together with a significant global platform for sharing their research findings and educational innovations.

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### Countdown begins for the 2011 Solar Car Race

In June 2010 The Cyprus Institute organized Cyprus' first solar car challenge; the event proved a great success and garnered considerable media exposure. The Cyprus Institute's Solar Car Challenge will become an annual event, with the next race scheduled for summer 2011 in the streets of Geroskipou Municipality.

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### Paphos campus opens

Renovation has been completed on the remarkable colonial Paphos District Officer's Residence. The historical building is now the administrative center of the Institute's Paphos campus; the premises will accommodate the Institute's Science and Technology in Archaeology Research Center (STARC), as well as conferences, seminars, outreach activities, and summer schools.

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## Cyl becomes a member of the prestigious ICAM Network

The Cyprus Institute, after an official invitation by the Institute for Complex Adaptive Matter (ICAM – <http://icam-i2cam.org>) has joined the global organization and became one of its 63 branches. With 32 branches in the United States and another 31 in Europe, Asia, South America, the Middle East, Canada and Australia, the Institute joins an elite group of institutions including among others Harvard, MIT, Princeton, Stanford, Cambridge, Forschungszentrum Juelich GmbH, École Normale Supérieure and Max Planck. ICAM provides a unique global access for its branch members' scientists to new research and educational initiatives and a significant global platform for sharing their research findings and educational innovations.

ICAM's international component, the International Institute for Complex Adaptive Matter (I<sup>2</sup>CAM) will provide the Institute's researchers a very important compendium of research opportunities in Europe, the Middle East, and Asia at ICAM branch member institutions. Junior researchers will receive support for attending workshops and summer schools abroad and for developing collaborations at leading overseas laboratories, while senior scientists will receive support for initiating or expanding collaborations with their colleagues at the many overseas institutions presently affiliated with ICAM.

ICAM's growing global science education and engagement network will offer the Institute the capacity to enhance substantially its education and outreach efforts through workshops and gain access to materials developed and lessons learned at other ICAM institutions.

Cyl and ICAM will be working together to connect existing research programs and research networks and establishing new ones, particularly in the field of climate change. Many of ICAM's affiliations have a deep interest in the global challenge posed by the climate change and all are involved in research and educational programs that can contribute in its mitigation.

## Countdown for Cyl's 2011 Solar Car Race

The countdown to Cyprus' second Solar Car Challenge scheduled for Summer 2011 has begun. The 2011 Challenge is coordinated by Dr. Tasos Anastasiou and will be organized in collaboration with the Municipalities of Geroskipou and Paphos. The race will take place in the streets of Geroskipou. This year The Cyprus Institute successfully organized, in collaboration with the Research Promotion Foundation, Cyprus' first solar car race in June 2010. Participants comprised of local and international teams, including local schools, the CERN Solar Club and the Jordan University of Science and Technology (JUST).

The Solar Car Challenge intends to promote the use of environmentally friendly renewable energy sources and raise awareness and enthusiasm on alternative technologies which make fewer demands on the environment. It serves as a unique opportunity for the participating students to take science out of the classroom and to truly engage in hands-on experiences, while encouraging them to further pursue studies in the fields of science, technology and engineering. The Challenge devises an innovative approach of allocating each vehicle a maximum budget of €20,000 with the main requirement being that all components are commercially available. Emphasis is given on design and engineering rather than fundraising.

The 2010 race was enthusiastically received by the public recording an excellent turnout and extensive publicity.



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## International Autumn School 2010 in Paphos

More than 50 international PhD students attended the second International Autumn School in Paphos in October 2010, which was organized by The Cyprus Institute in collaboration with the International Max Planck Institute for Chemistry (Mainz-Germany), the Research School for Socio-Economic and Natural Sciences of the Environment (Netherlands) and the Wageningen University (Netherlands).



The research school, organized by Prof. Jos Lelieveld, focused on the biogeochemical-physical interactions between the Earth's surface (land and ocean) and the lower atmosphere and was addressed primarily to doctoral students in Earth Sciences. Leading researchers in the field presented a rich lecture program, complemented by basic hands-on exercises, designed for attendants with different field backgrounds and methodology (both experimentalists and modellers).

### Cyl on CNN

Two of the major research thrusts of The Cyprus Institute received significant coverage from CNN in September 2010. The work being carried out on Climate Change and Solar Energy was featured on CNN's international documentary "Earth Frontiers", a monthly feature presenting reports from around the world on current energy and environmental issues.

The documentary investigated the desertification of Cyprus, which is expected to be exacerbated by the consequences of global warming through reduced precipitation and higher temperatures in the near future. The documentary presented The Cyprus Institute's Energy, Environment and Water Research Center (EEWRC) research for climate change and the solar cogeneration of electricity and desalinated water, which effectively tackles two issues at once: water shortage and production of clean electricity. Prof. Manfred Lange, Director of EEWRC, speaking during the program expressed his conviction that this will provide a model, not only for Cyprus, but for the Eastern Mediterranean as a whole.

[www.cyi.ac.cy/cnn](http://www.cyi.ac.cy/cnn)



## Technology Serves the Arts

The Science and Technology in Archaeology Research Center (STARC) of The Cyprus Institute made a significant contribution to the creation of the sculpture «Clepsydra 2009» which adorns the new Larnaca airport. The art work belongs to the prominent Cypriot artist Theodoulos Gregoriou whose work has been hosted at the Louvre Museum.

STARC's contribution includes the successful digital scanning of five ancient statue heads from the Archaeological Museum in Nicosia. Using state-of-the-art technologies, researchers of STARC led by Prof. Franco Niccolucci performed various tests on a virtual model, instead of a physical object. This resulted in a three-dimensional representation, used to mould the final sculpture.



# Cyprus a Regional center for High Performance Computing



The Computation-based Science and Technology Research Center (CaSToRC), developed in close partnership with the National Center for Supercomputing Applications of the University of Illinois, will have its first Teraflop/s scale super-computer operational in 2011. It will enable CaSToRC to offer computational services to the Cypriot and wider region's scientific community. It is financed through the Cy-Tera project, co-funded by the Research Promotion Foundation. The project will implement the first High Performance Computing (HPC) facility in Cyprus, serving the needs of the Institute and its partners for frontier research applications in the fields of Climate Studies, Desalination Processes, Visualization, Bioinformatics and Computational Physics. CaSToRC has in its short time of existence established pivotal links in the Supercomputing community. Since 2008 it represents Cyprus in the Partnership for Advanced Computing in Europe (PRACE), a unique persistent pan-European Research Infrastructure for High Performance

Computing. This enables scientists and engineers from Cyprus to access petascale computing facilities and thus obtain computational resources not available in Cyprus. In addition, it enables the Center to act as a bridge between the growing Computational Science community in the region and the established research networks and organizations in Europe. In 2009 CaSToRC signed a collaboration agreement with the Jülich Supercomputing Center in Germany, which hosts the largest supercomputer in Europe. The agreement foresees among other activities, the development of a joint Simulation Lab in Particle and Nuclear Physics providing expertise and advanced user support in frontier High Performance Computing. CaSToRC coordinates the 2.5 million Euro LinkSCEEM project funded by the EU that aims at Linking Scientific Computing in Europe and the Eastern Mediterranean. LinkSCEEM, coordinated by Prof. Constantia Alexandrou, aims at the establishment of a High Performance Computing eco-system

**Dr Kozakou Markoulli congratulated The Cyprus Institute for launching such cutting edge research projects**

in the Eastern Mediterranean region by inter-linking and coordinating regional computing, storage and visualization resources to form an integrated e-infrastructure. Initial emphasis will be placed in the fields of climate research, digital cultural heritage and other applications. In line with its ambition to transform Cyprus into a regional educational and research center, the Government of Cyprus has been highly supportive of the activities of CaSToRC and of its regional scope, as attested by the participation of Dr. Erato Kozakou Markoulli, Minister of Communication and Works at the inauguration event for the LinkSCEEM project organized in October at the Cyl premises in Nicosia. Dr Kozakou Markoulli congratulated The Cyprus Institute for launching such cutting edge research projects and stressed that "the work carried out by the Institute is of paramount importance as it contributes to the development and promotion of new technologies which are necessary to address the challenges faced by Cyprus".



Dr. Erato Kozakou Markoulli, Minister of Communication and Works at the inauguration event.

## IN BRIEF

### Solar Cogeneration of Desalinated Water and Electricity is viable

One of the 'flagship' projects of the Institute, the techno-economic feasibility study for solar-thermal co-generation of electricity and desalinated water (CSP-DSW project), was successfully concluded in June 2010. The study undertaken by the Institute for the benefit of the Cyprus Government was conducted in partnership with MIT, the University of Illinois and the Electricity Authority of Cyprus. The study highlights the impressive advantages and the regional suitability of the novel concept of solar thermal co-generation: it is technologically viable and economically sustainable in the Cyprus business climate and policy context. Assessment of the robustness and suitability of the technologies chosen in an island environment, and the re-evaluation of economic incentives for producing electricity and water from renewables, were amongst the critical recommendations of the study. The study presented a number of novel ideas, including an innovative storage system, the deployment of heliostats on hillsides and an advanced-design desalination system. An International Workshop was organized on June 23rd 2010, in Nicosia in which the findings of the study were presented to prominent scientists, stakeholders and policy makers from Cyprus and the region. The workshop received substantial publicity, with the Minister of Interior, Mr. Neoklis Sylikiotis opening the event. The Cyprus Institute has launched a number of research initiatives in continuation of the study, mainly for testing critical subsystems of the co-generation pilot unit at an experimental scale. A custom-designed high-efficiency Heliostat is being developed, while an advanced desalination system has been constructed and is currently being tested. These units will eventually be relocated for further testing in realistic conditions to the Cyl's Pentakomo Field Laboratory, which is to evolve into a fully-fledged testing facility. The Pentakomo Field Laboratory will be able to host a number of solar and desalination research projects and aims to become a unique experimental facility for the region.

## Climate Change Impacts and Possible Adaptation Strategies for Cyprus

Sophisticated atmospheric and climate models, developed and implemented at the Institute's Energy, Environment and Water Research Center (EEWRC) by the research group of Prof. Jos Lelieveld including Dr. Panos Hadjinicolaou and Dr. Andrea Pozzer, clearly indicate that the Mediterranean and in particular its eastern part will be hard hit by the effect of Climate Change. For Cyprus this will have a number of grave consequences. Even hotter summers, milder winters, and further decreasing precipitation are only a few of the major impacts of the anticipated consequences of climate change. Table 1 illustrates the magnitude of some of the

consequences of climate change for Cyprus. It is evident that days with very hot weather as well as so-called tropical nights are expected to dramatically increase in number. The increase in the consecutive days with precipitation below 1 mm does not look quite as dramatic. However, when looking at the projected winter precipitation, the prospects are quite bleak (Figure 1). The reduced rainfall and the growing demand for water is going to put extra stress on the regional water resources. Increased water-use-efficiency and desalination of seawater are seen as adequate response strategies to maintain a sufficient supply of potable water.

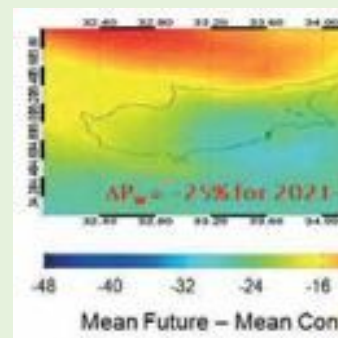


Figure 1: Average change in total winter precipitation (DPw)

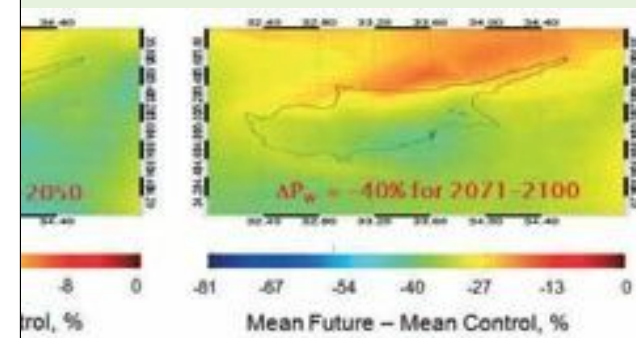


Figure 2: Average change in total winter precipitation (DPw)

Quantity	Today (1976-2000)	2021-2050	2071-2100
Days with $T_{max} > 35^{\circ}C$	60	85 (+42%)	120 (+100%)
Tropical Nights with $T_{min} > 25^{\circ}C$	75	120 (+60%)	165 (+120%)
Dry spells, consecutive days with precipitation < 1 mm	100	108 (+8%)	120 (+120%)

Table 1: Summary of some of the most severe consequences of anticipated climate change for Cyprus

However, desalination is an extremely energy-intensive process, requiring substantial quantities of electricity. At the moment the supply of electricity in Cyprus relies currently almost entirely on fossil fuels. This has resulted in emissions of carbon dioxide ( $CO_2$ ) and other greenhouse gases well above the rates allotted to Cyprus by the EU. These issues have been the main theme of the International Conference on Energy, Water & Climate Change in the Mediterranean & the Middle East, EWACC2010 (<http://ewacc.cyi.ac.cy>), organized by EEWRC in early 2010. An important result of this conference is the Cyprus Declaration on Climate Change, which states that innovative scientific, technological and agricultural solutions are needed to combat the negative consequences of climate change in the region.



## Digitalization of ancient Cypriot literature

The collection of ancient Cypriot literature 'Αρχαία Κυπριακή Γραμματεία', published by the Leventis Foundation, includes all the recovered texts by Cypriot authors until the Christian era. It comprises a unique literary collection of six volumes: Poetry, Epigraphs, Prose, Medicine texts, Works by Zeno and other Cypriot philosophers.

The Cyprus Institute through its Science and Technology in Archaeology Research Center (STARC) has launched a project for the digital encoding and publication of the literature which is of exceptional interest to scholars of the Classical period and of Cyprus' literature, philosophy and history. The digital product will be easily and freely accessible by the international scholarly community aided by powerful and sophisticated search tools. The project is partially funded by the Leventis Foundation and the National Science Foundation, U.S.A.

## Strategic agreement with the New Library of Alexandria

In July 2010 The Cyprus Institute and the New Library of Alexandria signed a Collaboration Agreement reaffirming their existing multi-level cooperation. The agreement foresees the joint organization of research and educational programs including digital libraries, tele-collaborative environments, recording and visualization of cultural heritage. Within the framework of the collaboration, Prof. Magdy Nagi, Head of Information and Communication Technologies at the Library of Alexandria, has recently visited the Institute to participate in the preparations of the research projects Cy-Tera and LinkSCEEM.



## AKEL - Progressive Party of the Working People visits The Cyprus Institute

A delegation from AKEL, led by the General Secretary of the party Mr. Andros Kyprianou visited the Institute in October 2010. The delegation visited a number of the research laboratories where the research staff presented some of the main research activities of the Institute.

The participants agreed on the urgent need for the further strengthening and development of research in Cyprus, in order to realize the goal of transforming it as a regional center for research and higher education. Mr. Kyprianou reiterated AKEL's support towards The Cyprus Institute and stressed the pivotal role that the Institute could play in the regional research scene.



## Paphos campus opens

The Cyprus Institute in summer 2010 held the inauguration ceremony of the newly renovated 'District Officer's Residence', which will serve as the administrative center of the Paphos campus of the Institute. The remarkable colonial building was part of sites and facilities offered by the Paphos and Geroskipou Municipalities to the Institute for its research and educational activities.

The building exterior has been restored, maintaining its historic integrity and original appearance. The restoration of the interior has been respectful to its historic layout and architectural elements as its infrastructure systems have been updated to accommodate the Institute's Science and Technology in Archaeology Research Center (STARC), as well as conferences, seminars and outreach activities. The construction of underground conference facilities adjacent to the existing building is under consideration.

## Opening of European Office

The new European office has been recently established thanks to the generous support of the A.G. Leventis Foundation in Paris. The office, strategically located near the decision-making centers of the French capital and with easy access to the headquarters of the European Union in Brussels, will allow the Institute to enhance its international presence and partnerships. The office also facilitates the Institute's extensive collaboration with French institutions, notably the Centre de recherche et de restauration des musées de France (C2RMF), the Institut Pierre-Simon Laplace (IPSL), and the Sophia Antipolis Foundation. The Office is headed by Dr. Bruno Rostand, Associate Vice-President for International Relations.



## Six New Board members

The Board of Trustees recently appointed six new distinguished board members to contribute to the development of the Institute. The new members are:



**Dr. Titos Christofides**, Ophthalmologist and Under Secretary to the President of the Republic of Cyprus.



**Prof. Anastasios Giannitsis**, Chairman of Hellenic Petroleum and Professor of Economics at the University of Athens.



**Prof. Peter Gruss**, President of the Max Planck Society and Director of the Max Planck Institute for Biophysical Chemistry in Göttingen.



**Mr. Kyriakos Kokkinos**, Engineer and General Manager of IBM Cyprus.



**Dr. Andreas Pittas**, Industrialist and until recently the Chairman of the Cyprus Employers and Industrialists Federation.



**Prof. Didier Roux**, Vice President for Innovation of the Group Saint-Gobain and member of the French Academy of Sciences.

## C Y I U P D A T E S

**Prof. Linda Katehi**, a Trustee of The Cyprus Institute and Chancellor of the University of California-Davis, has been appointed by the Prime Minister of Greece, to lead the new International Advisory Committee for Reforming Tertiary Education in Greece. The establishment of the Committee is part of the Greek government's strategy for improving tertiary education in the country.



**Prof. Ismail Serageldin**, a Trustee of The Cyprus Institute, was appointed by the President of France, to the International Chair "Savoirs contre pauvreté" (Knowledge Against Poverty), at the College de France, Paris, for the academic year 2010-2011.

**Prof. Fotis Kafatos**, member of the Scientific Advisory Council of the Institute, was awarded the prestigious Robert Koch Gold Medal in 2010. The Robert Koch Prize is one of the most prestigious scientific commendations in Germany. It is awarded annually, under the patronage of the German Minister of Health, for outstanding and internationally recognized scientific achievements.



Prof. Fotis Kafatos was also appointed as Chair of the recently established Cyprus Scientific Council, the advisory scientific body to the Government of Cyprus. The President of The Cyprus Institute, **Prof. Costas N. Papanicolas**, was also appointed at the Council as Vice-Chair. Both Profs. Kafatos and Papanicolas will be ex officio members of the Cyprus National Council for Research and Innovation, which was established as the highest Council charged with setting the relevant strategic directions for Cyprus.

## Two leadership appointments

The Board of the Institute has recently approved two leadership appointments, vital for the development of the Institute: the appointment of **Prof. Leonard Barrie** as Vice President of Research and **Prof. Dimitris Drikakis** as the founding Director of the Computation-based Science and Technology Research Center (CaSToRC).

Leonard A. Barrie is a leading international Earth System Science research scientist and manager, educated in Canada and Germany. Previously he held the position of co-Director of the

Research Department at the World Meteorological Organization (WMO) in Geneva implementing international research programs related to weather, climate, water and the environment. Dimitris Drikakis was previously Professor of Fluid Mechanics and Computational Science and Head of Department at Cranfield University in the UK. He has very extensive research experience in computational science and engineering for a broad range of applications in the fields of fluid dynamics, heat transfer and materials.

# Science and Controversies



By Edouard Brézin

The technological complexity of our societies makes it difficult for most citizens to arrive at an informed opinion on many scientific issues that we face in our daily life. How should we handle waste management? Is it necessary to get an injection for the coming influenza? Is it dangerous to use a cell phone so close to our brain? What are the potential benefits of genetically modified organisms and their dangers? Such questions concern all of us and it is thus disturbing to witness conflicting opinions among the so-called experts, who after all are supposed to provide the objective basis on which to base the policy decisions. The question of the influence of human activities on the evolution of the climate has generated recently controversies which have made headlines in the media. For many years the Intergovernmental Panel on Climate Change (IPCC) has gathered growing evidence that the production of CO<sub>2</sub> and other « greenhouse » gases, resulting from human activity, was very likely to affect dramatically our living conditions in many parts of the planet (and in particular the Eastern Mediterranean area). Clearly these findings have bothered many as it will adversely affect entrenched interests in a similar way that cancer research findings damaged tobacco industry profits; mounting evidence indicates that for years compa-

nies such as Exxon and the Koch industries, have financed anyone on the side of climate change denial. Indeed within the world of science, we have witnessed with some outspoken scientists, mostly non-climatologists, the attribution of the significant temperature increase of the last forty years to natural, non anthropogenic, causes. Some petroleum producing countries, along with the companies that stand to lose from regulation of the use of fossil fuels, have every reason to hide their obvious interests behind an imaginary "Climategate". It will be naive to expect a scientific debate whose outcome affects a multi trillion euro industry to be conducted "as usual" even within the scientific community.

**Some petroleum producing countries, along with the companies that stand to lose from regulation of the use of fossil fuels, have every reason to hide their obvious interests behind an imaginary "Climategate"**

The climate change skeptics are often advocating the necessity for science of open debates, pointing out that scientific "truth" does not rely on a majority vote. They are right on these points: there are more experts in the IPCC panels than skeptics but this is certainly not a convincing argument. So how can we form our opinion on such issues, vital to the future of our global village? Indeed debates are at the heart of science. Many scientific conferences are battlefields for conflicting views. When submitting an

article to a scientific journal the authors are ready to receive counter-arguments from the referees and they know that their article will be rejected if they are not able to answer convincingly. Therefore debates are welcome, but they make sense if, and only if, the actors operate in good faith: do not fake the data, take into consideration the adverse arguments, answer the criticisms.

So what about the climate controversy? The science of nature is not like mathematics with theorems which apply with absolute certainty. However, the minimum that we must require from the scientists, is that they operate in good faith. Well, contrary to what we have seen on the side of the skeptics, there is no doubt that the climatologists have used the best science available to them. The UN secretary has required from a panel of world science academies to look at the IPCC procedures and make suggestions for minimizing the risks of mistakes. This does not mean that mistakes are impossible, that the influence of human activities on the climate is a rigorously proven conclusion, but the scientists who have come to the conclusion that it is very likely, have done an honest job and it would be foolish and irresponsible to ignore their warning.

Edouard Brézin, Chair of the Cyl's Board, is a Professor of Theoretical Physics at École Normale Supérieure. He was elected a member of the French National Academy of Sciences in 1991 and served as its President from 2004 to 2006. He is the recipient of many distinctions and awards, both from the US and European Academies.

## C Y I I N T H E P R E S S

"Super computers to boost Cyprus' research standing" – *Cyprus Mail*

"International personalities at The Cyprus Institute" – *Phileleftheros*

"The Cyprus Institute opens its first international office abroad" – *Alithia*

"Technology serves the arts" – *Cyprus Airways magazine*

"The Cyprus declaration on climate change" – *Cyprus Weekly*

"An initiative to make the Presidential Palace green" – *Phileleftheros*

"A solar car race for the first time in Cyprus" – *Top Gear magazine*

"3D digital maps and virtual reconstruction of archaeological sites

from The Cyprus Institute" – *Politis*

"Cyprus Institute: International conference on climate change" – *Kathemerini*

"Fresh water from the sun" – *Realnews*

"The Cyprus Institute cooperates with the U. of Illinois" – *Simerini*

"Cyprus tourism eyes options as climate warms" – *Reuters*

"The Cyprus Institute collaborates with the Severis Foundation" – *Sunday Mail*

"AG Leventis Foundation helps Cyprus Institute open Paris Office" – *Financial Mirror*

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