The discovery of gravitational waves (GWs) in 2015 inaugurated the field of gravitational-wave astronomy, which is growing at an increasing pace worldwide. The promise of important discoveries in astrophysics, cosmology and fundamental physics attracts students, researchers and entire university departments from various backgrounds to this newly established field. Early-career scientists (ECSs) working on this topic today must thus build their research curricula by learning and combining knowledge, tools and methodologies from different disciplines. They represent the future generation that will have the responsibility to complete and improve the ongoing, multigenerational, large-scale GW experiments, push forward the related theoretical and data analysis efforts needed to maximize their science return, and drive future endeavours. ECSs therefore are in a unique position to contribute to current decisions on the roadmap for the field; shape data and publication policies; build a diverse and inclusive community; and pre-empt important issues inherent to ECSs themselves and the future of the field. The ECSs of today will be the leaders of tomorrow: now is the right time to start building the GW community of the future.

These were the premises that underlay the scope and rationale of the workshop on Gravitational-Wave Astrophysics for Early Career Scientists (GWÆCS), which was held virtually on 3–7 May 2021 with the support of the Lorentz Center in the Netherlands (Fig. 1). GWÆCS was designed to build networks across different communities and advance the professional development of ECSs working on GWs. Its principal goal was to plant the seeds to grow a community of ECSs with the scope of (1) becoming a strong and constructive voice for the future GW community; (2) addressing the needs of ECSs and fostering a healthy professional environment; (3) sharing career opportunities and learning valuable professional soft skills; and (4) ensuring that the international and interdisciplinary GW community shares a common scientific language, builds long-lasting communication channels and exchanges relevant research knowledge and tools for the benefit of its own future.

GWÆCS was designed to put equal emphasis on (and equal time towards) the future of GW science and the human development of the future GW community. On the science side, it offered a wide perspective on the future of GWs, focusing in particular on the expected scientific gain from forthcoming large-scale experiments and on the common effort needed to successfully complete them. Presentations by well-known experts from the different GW communities worldwide were followed by dedicated discussions chaired by experienced ECSs in an open and inclusive way and aimed at advancing the knowledge and gauging the expectations of ECSs regarding the future of GWs. On the human development side, GWÆCS offered training on soft and transferable skills, such as community leadership, outreach activity design, education on diversity and inclusion, awareness about well-being and mental-health issues, and how to search and interview for academic and industry positions. The workshop programme represented a mixture of overview talks on specific scientific and community topics, with an extended time for question-and-answer sessions, discussions and training. Most of the scheduled time was reserved for open-ended discussions (essential in an online setting), although the talks provided basic information, sparked interest and generated questions for the subsequent discussion sessions. The overview talks helped to connect the participants from different subfields, and to emphasize overarching challenges and visions for the GW community. Moreover, discussion sessions also served to collect different visions for the future of GWs with the aim of producing a constructive dialogue to provide a shared roadmap for the field. In addition, to introduce the participants and their own research activities to each other, one-minute poster presentations took place on the first day.

GWÆCS had two main deliverables: a community one and a material one. The first, intangible, deliverable was to establish the first step for a wide network of ECSs able to organize themselves outside big international collaborations clustered around large-scale GW experiments. Such a network is aimed at connecting all ECSs working in GWs in order to share relevant information, discuss issues not necessarily inherent to a specific GW experiment or topic, and foster long-lasting relationships to prepare a united GW community. This effort is currently underway, and in September 2021 a first follow-up online meeting was held among all the ECSs who actively took part in GWÆCS, together with representatives from the ECSs of different GW communities (in particular LISA, LIGO, Virgo and pulsar timing arrays). As a result of this meeting, a collective of ECSs emerged with the goal of creating an overall structure connecting ECSs in all different GW communities with the concrete scope of organizing and coordinating activities aimed at fulfilling the objectives outlined above, in perfect alignment with the spirit...
of GW/ECS. In addition, a related but spontaneous outcome of GW/ECS was the formation of initiatives aimed at assessing the carbon footprint of GW science, as it has become clear that ECSs are increasingly concerned about climate change. A small task force estimating the carbon footprint of LISA has already been assembled, but more such initiatives are expected to flourish as a result of GW/ECS.

On the other hand, the material deliverable of GW/ECS is a document summarizing the workshop (J.-B. Bayle et al., preprint at https://arxiv.org/abs/2111.15596; 2021). This collection of short summaries presents individual workshop sessions, giving a recap of the overview talks by well-known experts, but also, and perhaps more crucially, an extract from the interesting discussions between ECSs and speakers following those talks. These discussions were the main focus and strength of GW/ECS, as they gave a voice to ECSs and allowed them to ask anything about the specific topics under consideration. Collecting all these questions, comments and impressions in a single document will strongly benefit the whole GW community, and specifically its ECSs.

GW/ECS laid the foundation for building a community that in time will be able not only to address the most important questions in GW science, but also to do so by respecting and possibly improving the lives of the very people involved in the process.

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Competing interests
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