Brief Introductory Statements

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The remarkable resonance of the FAIR principles throughout the scientific community is largely a function of the meaning that we associate with the word "fair" and of the simplicity of the acronym. The four-letter acronym belies the many mechanisms by which the FAIR principles are to be operationalized, but most scientists are content with thinking about their data merely in terms of whether the data are FAIR or not. The enthusiasm for the FAIR principles indeed depends on keeping the details of those principles hidden from view. It is therefore tremendously exciting to see the emergence of new technologies that support data stewardship in a way that helps to ensure FAIR data while keeping the operationalization of the FAIR principles totally transparent. Just as we can browse the Web without thinking about the complex technology stack that makes Internet connectivity possible, we soon will be able to rely on an ecosystem of tools that assure the FAIRness of our data without having to think beyond the word "fair." The most important measure of progress in open science will be whether we can continue to improve the FAIRness of our data by means of approaches that remain largely invisible to their users.

Dr. Myles Axton
Dr. Myles Axton is a publisher at Wiley and editor in chief of *Genetics & Genomics Next*. He was the chief editor of *Nature Genetics* for 15 years. Before that, he was a university lecturer in molecular and cellular biology at the University of Oxford and a Fellow of Balliol College.

The early implementations of FAIR principles represented in this special issue, and the cross-cutting analysis of best practices emerging from each pioneering community point the way to effective computational

research. Taking this progress forward, publishers will be key to the social adoption of the rapid, machine-assisted scholarship enabled by research objects. To do this they need to implement two incentives, firstly to publish and celebrate rich metadata for contributor roles, not only for articles, but for datasets, consortia and protocols. Secondly, they should prominently display immediate transparent metrics of the use, transformation and interoperation of research objects and publications alike. These aims will lead us to unburden research articles of unnecessary formatting restrictions and semi-semantic decoration with data links, and in their place to offer models built of research objects together with enough narrative context to aid their examination, understanding and reuse. Provenance, license and metrics metadata are also the way to allow data producers and users to interact transparently and fairly. To permit immediate data reuse that is compatible with creators' rights and their intentions to build institutional capacity, data generators and their institutions must explicitly declare their reasons and purpose for each research object in provenance metadata. Publication conditions can then follow the principles behind copyright and intellectual property protection even as they are instantiated in an open, machine readable license that encourages reuse.

Prof. Dr. Rianne Letschert

Prof. Dr. Rianne Letschert is a Professor and Chair in Victimology and International Law at Tilburg University. She previously directed the International Victimology Institute Tilburg (INTERVICT). In 2012 she became a member of the Young Academy of the Royal Netherlands Academy of Arts and Sciences (KNAW), and was appointed as its chair in April 2015 till 2018. Professor Letschert has been Rector Magnificus of Maastricht University since 1 September 2016. She is a scientific member of the steering committee of the GO FAIR initiative on behalf of The Netherlands.

The need for machine-actionability of increasingly complex and multi-domain data, and the accompanying algorithms to optimally use these data, is now recognised by the broader scientific community and throughout most disciplines. With its roots in life sciences data, practices aimed at FAIR data and services are now gaining momentum in the humanities as well. We fully align with the FAIR principles as a university and in fact we have the ambition to become "fully FAIR". Also within my own field of law and victimology, important developments take place to discuss and implement the FAIR principles, taken into account the often sensitive data that is gathered. With some of the authors of the original FAIR paper in our departments, we feel we are in the forefront of this exciting movement, but it is very encouraging to see how pioneering implementations sprout everywhere. In order to maximise reuse of these early good practices, which is an intrinsic aim of the FAIR principles themselves, it is important to present them in a comprehensive way. While this special issue will only be able to cover a small portion of all early endeavours, it will likely inspire other efforts to bundle and expose useful and hopefully reusable solutions. I am also happy to note that efforts spread to non-European countries and especially those that have traditionally been missing out on optimal benefits from science. As the rector of a university, but also in my role a member of the Steering Committee of GO FAIR, I commend this effort to disseminate FAIR related practices and challenges.

Prof. Dr. George O. Strawn

Prof. Dr. George O. Strawn is currently the director of the Board on Research Data and Information at the National Academies of Sciences, Engineering, and Medicine where he focuses on Open Science and FAIR data. Prior to joining the Academies, Dr. Strawn was the director of the National Coordination Office (NCO) for the Networking and Information Technology Research and Development (NITRD) Program and co-chair of the NITRD interagency committee.

I whimsically divide the computer era into three parts: the past, of many computers and many datasets; the present, of one computer and many datasets (recall SUN's marketing slogan, "the network is the computer"); and the future, of one computer and one dataset. That is, I look forward to the solution of the problem of the interoperability of heterogeneous data, just as the Internet provided a solution for the interoperability of heterogeneous networks. No one doubts the changes (mostly benefits) that the Internet age has provided. I conjecture that the coming age of interoperable data will be as revolutionary as the Internet. And the concept of FAIR data has galvanized many in the R&D world to bring on that new world. In the US, a new definition of Open Science has emerged (see *Open Science by Design* published by the National Academy of Sciences in 2018) and FAIR Data is called out in that report as a requirement to realize that new vision. Also, AI has taken both the scientific and commercial world by storm. All current approaches to AI involve processing massive amounts of data. FAIR data will make an increasing part of the world's data "AI ready." It is important to follow the early implementation attempts of the FAIR principles and make them widely known and accessible for potential reuse. Therefore I commend this special issue of *Data Intelligence* and anticipate that it will be widely read.

Prof. Dr. Jianhui Li

Prof. Dr. Jianhui Li is a professor and director of CSTCloud at the Computer Network Information Center, Chinese Academy of Sciences. He also serves as Vice President at CODATA. Prof. Li has been long dedicated to promoting data openness, sharing and application. He is currently engaged in technologies concerning the development of next-generation open science platform-CSTCloud, and typical application of big scientific data management.

Data, the precious inputs and productive outputs of scientific research, is the robust engine for next-generation open science. However, to make data count, we should go even further. Besides open data, open science still calls for open access, open resources and open data infrastructures as well. Upon all the trends in Science, FAIR makes all these ideas practicable and achievable. FAIR is not only for data, but also for all kinds of resources sharing. So far, FAIR has been implemented in many cases, such as the research

in FAIR data metrics, integration into FAIR data platforms as well as FAIR education and other community outreach. In China, the open data boom is taking place especially after the launch of the national-level rules "Measures for Managing Scientific Data". Country practices include research data sharing at institutional, disciplinary and national level. Open data has been carried out through the window of not only national data centers within domains but also those of interdisciplinary data infrastructures. Data sharing culture and trustworthiness development as well as data metrics all serve as promoters for better and larger scale of data exchanges across borders. Based on all these practices, we welcome and embrace the FAIR principles. However, adhering to FAIR principles is a good start but not enough for all. We shall continue our country practices in all aspects to push the sharing of data and other resources under the umbrella of open science and for the sake of the broader social community.