

Training and Support for Bioinformatics: Theoretical and Practical Aspects

Ben-Dor, S., Butcher, S., Iyer, L.K., Kelso, J., LittleJohn, T.
Shachak, A., and Rubin, E*.

The instructors (see last page for additional details)

Eitan Rubin, Ph.D.

Head of the Bioinformatics and Biological Computing Unit, the Weizmann Institute of Science, Rehovot Israel.

Shifra Ben-Dor, PhD

Staff Scientist, Bioinformatics and Biological Computing Unit, the Weizmann Institute of Science, Rehovot Israel.

Sarah Butcher, Ph.D.

Head of the Bioinformatics Support Service, Imperial College, London., UK.

Lakshmanan K. Iyer, Ph. D.

Manager of Collaboration and Training, the Bauer Center for Genomics Research, Harvard University, USA.

Janet Kelso, M.Sc.

SA National Bioinformatics Institute, University of the Western Cape, South Africa

Tim Littlejohn, Ph.D.

Founder, Biolateral, NSW Australia.

Adjunct Professor, University of Sydney & University of NSW, Australia.

Aviv Shachak, M.Sc.

Department of Information Science, Bar-Ilan University.

Motivation and goals of the tutorial:

The bioinformatics revolution and accompanying explosion of data generation – both in type and volume - has led to a growing demand for bioinformatics training and support. To meet this demand, bioinformatics support centers are being established in many academic and commercial research centers, with the following goals:

- To collect, develop and maintain the data, hardware and software required for the researchers they support.
- To provide the researchers with the expert advice they require for making effective use of bioinformatics in their research.
- To provide the training required for efficient use of the tools available both locally and through the World Wide Web.
- To provide a wide range of one-on-one services, ranging in the expertise and involvement they require from support, through training and consulting, and up to collaboration.

In this tutorial, we will discuss the challenges of creating and maintaining effective support units. The following points will be addressed in detail:

- Infrastructure: different models for establishing powerful and flexible core infrastructure. Main problems and hidden costs will be discussed.

*To whom correspondence should be addressed. Email: Eitan.Rubin@weizmann.ac.il

- Training: Growing demand for bioinformatics training means that all bioinformatics support centers will be called upon to provide training for the software and data they provide. The planning of both introductory and advanced courses will be discussed using existing training models to illustrate course presentation.
- Support, consulting and collaboration for research projects: we will explore the relative cost and effectiveness of each approach. As examples, successful and well-established programs such as EMBnet, S* and the Asia Pacific Bioinformatics Network will be analyzed. We will also introduce concepts from the field of information sciences, such as the barriers and limitations for the adoption of bioinformatics by experimental biologists, as well as the methods that we are currently developing to overcome those barriers.

The purposes of this tutorial are:

- To introduce the common problems and solutions involved in establishing and operating a bioinformatics support team to those who are running, starting, or who contemplate starting bioinformatics support services.
- To provide a theoretical framework as well as practical know-how for effective design of training and support programs.

Intended audience:

This submission of this tutorial is in response to the significant interest in the topic shown by the attendance at the *Bioinformatics support, training and services* BOF at ISMB02.

1. Bioinformaticians who teach, consult upon and support bioinformatics, or intend to do so.
2. Scientists who are responsible for establishing programs for teaching, consulting and support of bioinformatics.

Tutorial outline:

1. Introduction

2. Why bioinformatics support and training is so critical to the growth of the field

- Basic concepts from diffusion of innovation theory
- An introduction to the change agent concept
- An overview of the three groups of bioinformaticians: the experimental biologists, the algorithm/application developers, and the interdisciplinary bioinformaticist-highlighting needs, expectations, contributions to, and uptake of services

3. Knowledge transfer: the challenge of professional training in an academic setting.

- The right staff: skill profiles, recruitment and retainment issues
- The tools of the trade: From support, through teaching and consulting, and up to research collaborations.

4. Hardware, Software and Data infrastructure

- Special requirements.
- Typical solutions and scaling.
- The hidden costs.

5. Networking: organizations and alliances you could use

- European Molecular Biology Network (EMBnet)

- The Star Alliance (S*)
- Asia Pacific Bioinformatics Network. (APAN)

6. The F word: funding models for a bioinformatics support service

7. Case studies

About the instructors

Eitan Rubin (PhD). Eitan heads the Bioinformatics and Biological Computing Unit of the Weizmann Institute of Science, established 1988. His group is responsible for bioinformatics training and consulting for over 1500 scientists and students. Dr Rubin has research experience in experimental biology and in bioinformatics, having developed and applied techniques that span both fields. Teaching experience includes multiple courses in Israel, and teaching in international workshops and courses on bioinformatics. Dr. Rubin is a member of the education workgroup of the ISCB and the Israeli representative for EMBnet board.

Shifra Ben-Dor (PhD). Shifra earned a PhD in Immunology and moved to bioinformatics in her postdoc at the Bioinformatics and Biological Computing Unit of the Weizmann Institute of Science, and INN (the Israeli National Node of EMBnet). Dr. Ben-Dor joined the unit as staff scientist in 2001. Shifra also currently heads INN, providing national bioinformatics support, and has been involved the operation of ICCBnet. She has extensive experience in all aspects of user support - particularly providing solutions to bench scientists, as well as education, developing courses, workshops, and websites.

Sarah Butcher (PhD). Sarah has been actively providing bioinformatics resources and training for academics for over 5 years. After 3 years of managing Oxford University Bioinformatics Centre, Dr. Butcher recently joined Imperial College London where she is developing a new bioinformatics service for researchers and students. She has developed and run successful commercial bioinformatics courses aimed at industry as well as having been extensively involved in developing and teaching courses for bench scientists. She also lectures on the Imperial College Bioinformatics MSc course.

Lakshmanan K. Iyer (PhD). Lakshmanan recently moved to the Bauer Center for Genomics Research (CGR) at Harvard University, USA as the "Manager of Collaboration and Training" and as the interim leader of the Computational Biology Research Support program being developed there. Drawing on his last few years of experience, first at the supercomputing center (ABCC) of the National Cancer Institute at Frederick, MD, USA (NCI-FCRF) and later at the Harvard Medical School's Research Computing Center in providing consulting, training and collaborative support for researchers in computational biology Dr. Iyer is currently actively working on the CGR project.

Janet Kelso (MSc). While completing her PhD in bioinformatics at the South African National Bioinformatics Institute (SANBI) Janet held positions as the South African EMBnet Node Manager, and is secretary for the EMBnet Education and Training Portfolio Committee. During this time she has been involved in the establishment of bioinformatics services, training and research in South Africa, and in the support of bench scientists' bioinformatics needs. In addition Janet has taught on a number of local and international bioinformatics courses and contributed towards the development of curricula for bioinformatics programs.

Tim Littlejohn (PhD). Tim has a Ph.D. and post-doctoral research experience in molecular genetics, had assignments with international IT consultants *Andersen Consulting* (now *Accenture*), was director of informatics at the Canadian Genome Program, and was Head of the Australian National bioinformatics facility (ANGIS) prior to forming and acting as a director, CEO and CSO of bioinformatics companies Entigen Inc in 1998 and BioLateral Pty Ltd in 2001. Dr. Littlejohn has extensive experience in bioinformatics education through the professional training he runs through BioLateral, and in advising various bioinformatics degree programs in Australia as well as through university lecturing as part of his adjunct Professor positions at the University of Sydney and at University of NSW. In the past he also developed curriculum and taught courses as head of ANGIS. He has extensive bioinformatics support experience in genomics-labs (Canada), National facilities (ANGIS), global bioinformatics service companies (Entigen) and bioinformatics professional training and contracting (BioLateral).

Aviv Shachak (MSc). Following his M.Sc. in horticulture, Aviv is currently a doctoral student in Information Science at Bar-Ilan University, Israel. He is also a visiting student at The Weizmann Institute of Science, Israel. His dissertation topic is "The effect of training methods on perceptions and intended use of bioinformatics tools". Aviv has over 10 years of experience in teaching and developing science and computer assisted learning programs based on contemporary learning theories.
