

# Chapter 7

## The Bioinforma “TICKS”: Frequently Asked Questions



Prashanth N. Suravajhala

**Abstract** What is bioinformatics?

Bioinformatics is a tool, whereas computational biology is a discipline. Bioinformatics predicts the biological outcome and can be used to compare the biological data, for example, sequence analyses and structure prediction. In a nutshell, bioinformatics predictions can lessen the scale of experimentation. Bioinformatics can be considered as a method to annotate the newly sequenced genomes. It can be well defined in the biological and computational way.

### 1. What is bioinformatics?

Bioinformatics is a tool, whereas computational biology is a discipline. Bioinformatics predicts the biological outcome and can be used to compare the biological data, for example, sequence analyses and structure prediction. In a nutshell, bioinformatics predictions can lessen the scale of experimentation. Bioinformatics can be considered as a method to annotate the newly sequenced genomes. It can be well defined in the biological and computational way.

*Definition from biologists' perspective.* Application of informatics and statistics to solve, analyze, annotate, and organize biological data in graphical and browsable formats.

*Computational scientists' perspective.* Design computational algorithms and applications for solving biological problems. By analyzing the existing biological data using information technology, we can predict the biological outcomes. Planning the analysis by workflow using bioinformatics tools and knowing the expected output of the workflow will help to predict and solve the biological problems. The bioinformatics era has been started, and data are generated in huge

---

P. N. Suravajhala (✉)

Department of Biotechnology and Bioinformatics, Birla Institute of Scientific Research, Jaipur, India

Bioclues Organization, Hyderabad, India

e-mail: [prash@bioclues.org](mailto:prash@bioclues.org); <http://bioclues.org>

© Springer Nature Singapore Pte Ltd. 2021

P. N. Suravajhala (ed.), *Your Passport to a Career in Bioinformatics*,  
[https://doi.org/10.1007/978-981-15-9544-8\\_7](https://doi.org/10.1007/978-981-15-9544-8_7)

amounts by next-generation sequencing (NGS) in every field of biology, increasing the need for bioinformatics analysis.

2. Where can I be placed? Are there any companies working in the area of core bioinformatics research?

There are many institutes that require bioinformaticists to work with. After all, the role of bioinformaticist/bioinformatician is to help wet laboratory biologist plan his experiment or lessen his scale of experimentation using in silico methods. Say in India,

- Indian Institute of Science (IISc), Bangalore
- Indian Institute of Technology (IIT)
- Indian Institute of Science and Educational Research (IISER)
- National Center for Biological Sciences (NCBS), Bangalore
- Institute of Bioinformatics and Applied Biotechnology (IBAB), Bangalore
- Jawaharlal Nehru University (JNU), New Delhi
- Jawaharlal Nehru Center for Advanced Scientific Research (JNCASR)
- National Institute of Mental Health and Neuro-Sciences (NIMHANS).

And a host of all bioinformatics centers developed by the Department of Biotechnology, Government of India.

3. Can I get placed in companies? Are there any companies that have bioinformatics resources/placements?

- Astrazeneca
- GVKBio
- AravindBio
- Reddy's laboratories
- [Ocimumbio.com](http://Ocimumbio.com)
- Biocon

4. What are the branches/fields of bioinformatics?

- (a) Computational Biology
- (b) Drug Designing
- (c) Phylogenetics
- (d) Structural bioinformatics
- (e) Population Genetics
- (f) Genotype Analysis
- (g) Systems Biology
- (h) Synthetic Biology
- (i) Functional Genomics

5. People say that bioinformatics has no scope. Is it true?

No, it is not so. Research is measured with publications, and now, almost all high impact factor journals are accepting with bioinformatics analysis in the articles. This shows the importance of bioinformatics in all fields of biology.

6. Do I need programming experience to become a good bioinformaticist?

Yes, one does need programming experience for that. It helps to understand the most bioinformatics tools and their functionality; maybe you do not write your programs, but surely it is an asset to learn more as a bioinformaticist.

7. How is cheminformatics different from bioinformatics?

Cheminformatics deals specifically with the chemical structures, whereas bioinformatics deals with the biological systems and signaling pathways. Both the fields are devised so as to be able to manage huge data easily and come up with respective tools and techniques to study the same.

8. I am a B.Tech graduate. How can bioinformatics help me?

There are two options available: The first one is to go for M.Tech and then Ph.D., and the second option you can opt to work as a project assistant with funded projects or as a trainee/junior post with a bioinformatics organization. If you like to have a good grip on bioinformatics and start your career with a good level, better go for the first option.

9. Whither bioinformatics?

When it comes to bioinformatics, the biologist has the opinion of just storing the data or searching from different databases such as doing the BLAST search, and now things have changed with the time. As the different genome project moved up and algorithmic solution needs with large data, thus biology itself has changed from a dogmatic, “disciplinary” or “pathway-based” science, to a broader, multidisciplinary exercise.

10. What’s new in bioinformatics?

According to Shankar Subramaniam of the University of California, San Diego, there is a new “central dogma”; genomes code for gene products, whose structures and functions are embedded in the pathways and physiology of biological activity. Each metabolic pathway can no longer be considered in isolation but in the context of the interlocking and cross-coupled networks in which each component of that pathway participates. So, the next solution is with a bioinformatician. According to Leroy Hood, founder of the Institute for Systems Biology in Seattle, such an approach not only needs a greater infrastructure (DNA/gene expression array technologies, proteomics, multiparameter cell sorting, mass spectroscopy, single-cell assays, etc.) than traditional disciplines (molecular/cellular biology, biochemistry) but also requires advanced computational technologies. The major challenge the bioinformatics/system biology is facing, for now, is trained bioinformatician and sufficient funding; here at Bioclues, we have taken the one challenge to have 2020 bioinformaticians by 2020.

11. Who coined the term bioinformatics?

Paulien Hogeweg of the University of Utrecht, Netherland, coined the word Theoretical Biology in late 1980s.

12. How good the salary would be for a bioinformaticist?

It depends from one country to the other. As far as India is concerned, for a beginner, one can expect 30k per month while medium-level scientists 40k and a Senior level 60k.

13. Can I do a Ph.D. in bioinformatics? Where?

Of course, you can. But please understand that bioinformatics is a tool. You may have to complement the wet laboratory analysis done by someone or you need to liaise with a wet laboratory biologist.

14. Is there any integrated course/curriculum for bioinformatics?

No. But IBAB, Bangalore has recently started the program. Many IISER institutes in India have recently started a 5-year integrated program catering to the needs of student scientists.

15. Where can I undergo training after undergraduation/graduation in bioinformatics?

After completing your graduation/undergraduation, try to seek a position in a reputed laboratory, which is working on bioinformatics. In this way, you would learn many tools and techniques which shall be adding to your profile.

16. I want to do a project in bioinformatics. Can you suggest to me?

For doing a bioinformatics project, try approaching the people who are actually working on it in various research institutes by surfing the internet and writing those emails. Apart from this, you can enroll for a live virtual project with Bioclues itself and get real-time problems to solve under the guidance of top-notch scientists.

17. If I take up M.Sc. bioinformatics, won't my area be more specialized and narrower? Can you suggest to me to take up a broader area for my masters?

Your subject would be more specialized as compared to any other broad field. No doubt about it, but you would be an expert in it. If you are confused as to whether bioinformatics is your cup of tea or not, then go for a broad subject for your masters in which you may study one paper on bioinformatics and later on pursue higher studies in the same to have the expertise.

18. I have done my B.Tech in bioinformatics. I am planning for my masters. I am confused between MS (Research) and M.Tech. I would like to know your valuable opinion on the career prospects of MS in biotechnology and MS in bioinformatics as per the industry standards.

We would suggest you to always go by "interest" because opportunities reckon by interest not necessarily by choice. MS by research is a "mentored" degree, and as a protege, you will be free to undertake a project of your interest. Typically, it lasts for 1.5 years with a small amount of time dedicated to teaching the program. Both MS by research and M.Tech allow you to gain in-depth exposure to the component parts of bioinformatics. While the former focuses on research, the latter on pure taught program.