CORPUS OF FRANCIS CRICK’S RESEARCH PAPERS: USEFUL GUIDES IN MANUSCRIPT PREPARATION FOR GRADUATE STUDENTS

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ABSTRACT

In this editorial, Francis Crick’s research corpus of 105 papers, spanning from 1950 to 2013, is promoted as useful guides in manuscript preparation for graduate students. Especially to be noted is Crick and his co-authors’ versatility in formulating the different components of a research paper such as, title composition, abstract writing, brevity in describing the experimental results or hypotheses, discussion and/or future projections, and acknowledgment composition.

Keywords: bibliography, DNA, molecular biology, neuroscience, scientific productivity

Introduction

As the birth centenary of Francis Harry Compton Crick (1916 – 2004), one of the founders of molecular biology, is celebrated this year, I venture to contribute my share to Crick scholarship. By general consensus, Crick was a multi-faceted scientist, a great thinker (a theorist par excellence and provocateur), science expositor and a prolific writer. For his pioneering efforts in elucidating the DNA double helical model in 1953, Crick shared the 1962 Nobel Prize in medicine/physiology with his junior collaborator James D. Watson and Maurice Wilkins.

Crick’s contributions to science journals on varied research themes, including crystallography, molecular biology, embryonic entomology, neuroscience, somnology (scientific study of sleep) and behavior from 1950 to 2013 possess a high degree of clarity and brevity. As such, I believe that Crick’s corpus of 105 research papers can serve as useful guides in manuscript preparation for neophyte graduate students who wander into this territory with trepidation.

Bibliography

To promote my opinion, I present a Crick chronological bibliography of published papers at the end (see, Appendix below). This material was culled from standard databases such as PubMed, Profiles in Science National Library of Medicine https://profiles.nlm.nih.gov/SC/, Web of Science, SCOPUS and Wellcome Library Francis Crick Papers http://wellcomelibrary.org/collections/digital-collections/makers-of-modern-genetics/digitised-archives/francis-crick/.

[PLEASE NOTE: As this bibliography is chronologically arranged, it is not in alphabetical order of authors, as stipulated for this journal’s contributions.]

Commentary

A synopsis of Crick’s scientific career is presented in Table 1. In describing his career, Crick had observed, "I myself was forced to call myself a molecular biologist because when inquiring clergymen asked me what I did, I got tired of explaining that I was a mixture of crystallographer, biophysicist, biochemist and geneticist, an explanation which in any case they found too hard to grasp." (Crick, 1965) Subsequently, after he moved to San Diego, USA, in 1976, Crick switched his interests to neuroscience too.

In Table 2, I provide a classification of Crick corpus of papers, based on six specific categories. These are, experimental (crystallography) papers, hypothesis papers, challenging the status-quo papers, expository (popular) articles, future projection papers and retrospective papers. It should be noted that these categories are arbitrary and not exclusive of each other.

What is perhaps useful for graduate students and budding young scientists in post-doctoral phase is the fact that majority of Crick’s papers are comparatively short. As is shown in Table 3,
among the 105 papers, 83% do not exceed more than 10 printed pages (including tables, figures and other illustrations). More than half (56 papers) of Crick’s papers do not exceed more than five printed pages. Such brevity is valued by journal editors in describing the experimental results or hypotheses. Crick also practiced brevity in titling some of his papers with two or three words. Here are some examples: Codes without commas (Crick et al, 1957), Diffusion in Embryogenesis (Crick, 1970a), Directed panspermia (Crick and Orgel, 1973), Kinky helix (Crick and Klug, 1975), Selfish DNA (Orgel et al, 1980), DNA today (Crick 1982b), Neural Edelmanism (Crick, 1989), and The Zombie within (Koch and Crick, 2001).

Crick also wrote four popular books in science, among which one was his memoir ‘What Mad Pursuit’ (1988). Other three books include, ‘Of Molecules and Men’ (1966), ‘Life Itself: Its Origin and Nature’ (1981) and ‘The Astonishing Hypothesis’ (1994). (Fig. 1). Furthermore, as a trend-setter and path breaker in new disciplines, Crick was also fond of introducing new terms to science lexicon. These include, rumination – referring to the dreams we do not remember and ‘reverse learning’ (Crick and Mitchison, 1983), Neural Edelmanism – referring to the novel concept of ‘Neural Darwinism’ proposed by Gerald Edelman (Crick, 1989, 1990) and zombie agents (Koch and Crick, 2001).

In his preface to ‘The Astonishing Hypothesis’, Crick had written, ‘There is no form of prose more difficult to understand and more tedious to read than the average scientific paper.’ This is obviously true. But, Crick’s scientific papers are exceptions to this truism. In conclusion, I’d suggest that many of us have our idol singers, idol actors, idol sportsmen and idol novelists. In a similar vein, young science students who are keen on improving their paper writing skills will benefit much from the corpus of papers left to us by Crick. With a degree of pride, this scientist can attest that he was a beneficiary of Crick’s expressive writing, when he chose Crick as his idol scientist three decades ago.

Appendix: Chronological Bibliography of Francis Crick


Table 1: Synopsis of Francis Crick’s Scientific Career

<table>
<thead>
<tr>
<th>Year/Period</th>
<th>Details</th>
</tr>
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<tbody>
<tr>
<td>1916 June 8</td>
<td>born at Weston Favell, Northampton, UK.</td>
</tr>
<tr>
<td>1937</td>
<td>graduated with Physics degree from University College, London</td>
</tr>
<tr>
<td>1937-1939</td>
<td>graduate student in physics at University College, London, under Edward Andrade.</td>
</tr>
<tr>
<td>1940-1947</td>
<td>Temporary Experimental Officer, Royal Navy, UK.</td>
</tr>
<tr>
<td>1947-1950</td>
<td>studied biology, Cambridge University</td>
</tr>
<tr>
<td>1951-1955</td>
<td>James Watson (b. 1928) collaboration period</td>
</tr>
<tr>
<td>1953</td>
<td>DNA double helical model papers, co-authored with Watson.</td>
</tr>
<tr>
<td>1954</td>
<td>Ph.D. for X ray diffraction studies in Polypeptides and Proteins</td>
</tr>
<tr>
<td>1957-1976</td>
<td>Sydney Brenner (b. 1927) collaboration period. Formative period for Molecular biology as a discipline established.</td>
</tr>
<tr>
<td>1962</td>
<td>Nobel Prize for Medicine, shared with Watson and Maurice Wilkins</td>
</tr>
<tr>
<td>1966</td>
<td>‘Of Molecules and Men’ published, aged 40.</td>
</tr>
<tr>
<td>1977</td>
<td>Moved to San Diego, California, USA.</td>
</tr>
<tr>
<td>1981-2004</td>
<td>Christof Koch (b. 1956) collaboration period. Shifted focus to Neuroscience, sleep and consciousness.</td>
</tr>
<tr>
<td>2004 July 28</td>
<td>died at San Diego, California, USA.</td>
</tr>
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</table>

Table 2: Classification of Crick Corpus of Papers based on Categories

<table>
<thead>
<tr>
<th>Categories</th>
<th>Representative Examples</th>
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</table>
Table 3: Classification of Crick Corpus of Papers based on Length

<table>
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<tr>
<th>Length of Paper (unit=no. of journal pages)</th>
<th>Number of Papers</th>
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<tr>
<td>1 – 5</td>
<td>56</td>
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<tr>
<td>6 – 10</td>
<td>31</td>
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<tr>
<td>11 – 20</td>
<td>12</td>
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<tr>
<td>21 – 30</td>
<td>3</td>
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<tr>
<td>39</td>
<td>1</td>
</tr>
<tr>
<td>44</td>
<td>1</td>
</tr>
<tr>
<td>82</td>
<td>1</td>
</tr>
<tr>
<td>Total</td>
<td>105</td>
</tr>
</tbody>
</table>

Fig.1. Two books authored by Crick; his memoir *What Mad Pursuit: A Personal View of Scientific Discovery* (1988) and his explorations about the mystery of consciousness *The Astonishing Hypothesis* (1994).