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The Misleading Nature of Scientific Publications

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This paper was composed as part of an honors writing intensive assignment in BIOCHM 2482H taught by Dr. Thomas J. Reilly. In the course, students were encouraged to analyze and criticize scientific publications that are often held to unrealistic standards of rigor by the public. The assignment entailed a reading of *The Double Helix*, which described the discovery of the structure of DNA from the perspective or Dr. James D. Watson, and then analyzing the wholly different experience depicted by this book as compared to the formal publication of the discovery in *Nature.* This paper explores the scientific endeavor as but one part of a web of beliefs and attitudes that constitute a social identity rather than a concept to be understood in isolation.

The public controversy sparked by James D. Watson's narrative of the discovery of the structure of DNA is a memorable peculiarity in the world of scientific reports. Conventional scientific writing typically undergoes extensive revision. They are molded into a final product that is technical and succinct to the point where they may even appear like "fabrications, pieced together to create pleasing stories which, although they are sometimes reflections of nature, are rarely mirrors of the scientist at work" (R.S. Edgar). Watson, on the other hand, holds no mercy with regards to personal exposure for others or himself in this written memoir of his journey. Illustrated through an honest, unapologetically authentic narrative that encompasses both the good and bad aspects of the discovery process, *The Double Helix* documents the meticulous pursuit of an uncertain triumph as Watson experienced it firsthand. Although Watson admits that many comments may "seem one-sided and unfair" because he wanted to "convey the spirit of an adventure characterized… by youthful arrogance" (xi), the work nonetheless provoked outcries from colleagues who felt egregiously misrepresented. Free from dry data presentation and straightforward conclusions emblematic of conventional scientific writing, Watson's chronical brims with superfluous information. With no shortage of gossip, the piece teems with quirky personal

experiences having little impact on the discovery itself. Watson arranges a narrative that engages the reader in a deeply intimate manner with, not just the author, but also the private lives of all those whom Watson worked with, thus effectively downplaying common, homogeneous notions of research as straightforward and logical.

Indeed, scientific publications are concise reports selectively culled from extensive experimentation, yielding empirical data free of superfluous emotions and experiences that comprise the entirety of Watson's personal anecdote in *The Double Helix.* In a sea of technicality, jargon, and struggle for logical paradigms, Edgar's statement rings true: the authentic experience and character of the authors are effectively drowned out to achieve a pleasing story which, although does sometimes accurately reflect nature, rarely offers any insight into the raw process of discovery as it occurred.

Scientific publications are incisively pithy, free of personal anecdotes, emotions, and anything not immediately relevant to the report. However, the style and conventions of formal reports have not remained stagnant over time. In fact, some may argue that the more sophisticated science has become, the more difficult it becomes to elucidate the process in reciprocal discourse (Sheffield). However, this is exactly why the scientific community prioritizes clarity in optimized reporting that conveys information without redundant language that may be flowery or ambiguous. Even if three words may clarify a concept in simpler terms, fellow academics are expected to understand jargon. For instance, Rahfeld et al. (2019) stated, "At the base of the active-site pocket, the non-reducing end galac-tosyl moiety, which is the distinguishing group between A and B antigen, makes hydrogen-bonding interactions with His 97, Glu 64 and two of the metal coordinated waters." To the layman who might not grasp the significance of the "end galac-tosyl moiety", this sentence does not hold any value. However, to those proficient in biology and chemistry, it reveals important considerations of the molecular basis of blood antigen interactions. This style of frank reporting is typical of modern scientific papers. Similarly, although Watson and Crick's 1953 manuscript mentioned the most plausible tautomeric form of DNA bases to be keto, it did not describe what tautomers were, or even what the significance of the keto conformation would be (Watson and Crick 737-738). On the contrary, *The Double Helix* explicates this realization through a personal interaction between Jerry Donohue and Watson in their shared workspace, rich with details about Watson's retorts and Donohue's insistence on organic chemists' "bogus." Thus, though both works were authored by the exact same person describing the same event, the stark contrast in his report and mischievous narration is but a glimpse into the true disparity between publications and the processes that led up to them.

Scientific Writing and Science Writing

In order to parse the difference between Watson's account and standard research reports, it may be helpful to establish a key distinction between scientific writing and science writing. Scientific writing is most often used to describe technical writing by a scientist to an audience of peers—other scientists. Science writing, on the other hand, is simply writing about science for the general public (Sheffield). Examples of science writing include articles published in *Discover Magazine* or *Scientific American*. Although these terms have not been rigorously defined, it is a useful qualification nonetheless. Watson's personal account of his journey in *The Double Helix* overflows with gratuitous details completely irrelevant to the scientific process and expounds his lifestyle as a Midwestern American conducting research in England in the 1950s. Apparently, Watson's life was not only intellectually invigorating but also socially rewarding. He describes enjoying fine ales, parties, and dinners at the "Green

Door." Therefore, even the content of *The Double Helix* itself differs fundamentally from conventional scientific writing. Overflowing with anecdotes of Watson's personal life, the book itself is not so much a report on his discoveries as an account of an important period of his life which happened to be about a research experience. This vivid portrayal of Watson's personal odyssey of discovery invites readers to vicariously embark on his journey as a nonintrusive witness of arguably the most important scientific discovery in history. Thus, it is an important addition to the collective knowledge about the scientific process as very convoluted, intricately unique to the individual, and representative of Edgar's contention that scientific publications are rarely mirrors of the scientists responsible.

Expression Versus Convention

According to Watson, "styles of scientific research vary almost as much as human personalities" (xii). In order to confess the true nature of scientific research as a very human endeavor intrinsically forged by personalities, culture, and time, as opposed to popular stereotypes about its systematic and straightforward methodology, Watson's bluntness about the characters in his story possesses an air of candor unrivaled in the scientific community at the time. *The Double Helix* itself is an unabridged anecdote which violates almost every rule of scientific writing. Even towards Watson's closest companion in the ambitious undertaking, Francis Crick, there is no mercy in criticism and offhand comments about seemingly unrelated gossip. For instance, Watson portrays Crick as a womanizer who likes to drink and attend parties with pretty girls. He writes, "There was no restraint in Francis' enthusiasms about young women" (Watson 65). In fact, part of what makes the story so engaging to the casual reader is the detailed drama between Maurice Wilkins and Franklin. Even at the introduction of the two characters, Watson explained that "the real problem, then, was Rosy. The thought could not be avoided that the best home for a feminist was in another person's lab" (Watson 20). Throughout the entire book, Watson regularly recounts Wilkins' complaints against Franklin, whom he dubs "Rosy," albeit not affectionately. These anecdotal asides, unseen in the realm of scientific writing, make regular appearances not only in digressions about King's College but also in Cambridge's race against Linus Pauling. According to Watson, Pauling embarrassed the Cambridge group by seemingly always reaching the important conclusions before them. Once in the past, he even revealed a fundamental blunder of Bragg's suggestion on the shape of the peptide bond. This interesting supplement offers yet another exciting piece of drama which demands the reader's sustained attention. In fact, the entire narrative is filled with the private dilemmas of everyone involved, from Sir Lawrence Bragg's insecurities about his father to Herman Kalckar's divorce. None of these details would ever be evident from the published scientific manuscript because it was deliberately written to give a straightforward conclusion. The scientific process is a multilinear one evolved from several different sources simultaneously, but only the most relevant details key to the coherency of the report were included, thereby reinforcing Edgar's observation that scientific writing can almost be described as "fabrications" selectively pieced together from a preliminary horde of miscellaneous clues and experiences.

The standard for literature held sacred within the scientific community demands objective accounting void of subjective observations and certainly no emotional outbursts. *The Double Helix,* on the other hand, delivers an intimate view of the personalities and emotions of Watson and his colleagues. Watson is vividly observant, portraying the enterprise in a thrilling story which manages to be full of tension that is suspenseful at times and irreverently comical at others. These adjectives all seem quite out of place for a scientific report, but this unfiltered perspective epitomizing the spirit of youthful arrogance is

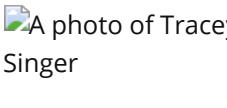
perhaps what continues to make it attractive to both researchers as well as a lay audience. For instance, Watson's choice of diction is often so unexpected that it offers comedic interjections when the audience least anticipates it. When describing the nature of X-ray crystallography, Watson explained that "it made no sense to learn complicated mathematical methods in order to follow baloney" (Watson 32). When recounting his first impressions of Franklin, he described that "...At the age of thirty-one her dresses showed all the imagination of English blue-stocking adolescents" (Watson 17). However, Watson does credit Franklin when it is appropriate. When he realized the motivation behind her previous agitation, he yielded that "her past uncompromising statements on this matter thus reflected first-rate science, not the outpourings of a misguided feminist" (Watson 212). Though many comments were undeniably disrespectful to the researcher, Watson's mischievous depiction is likely not a reflection of intentional public humiliation or offense; instead, it presents an additional layer of authenticity to an important tale that is often oversimplified by simple statements of fact and encapsulated by information confined to the formal publication.

Interdisciplinarity in an Age of Increasing Specialization

Although curiosity may compel those not part of the process to learn the happenings on the "inside," formally presented material is often much too complex to be accessible to the general public. Research is advancing to the point where specialization has left only the experts capable of understanding the minute jargon inevitably present in a paper, even though science is actually becoming more interdisciplinary in an age of increasing specialization. Thus, there is a simmering movement towards yet another literary evolution past draconian standards, to cultivate the cross-fertilization of ideas so remarkably integral to innovation. There exists a fine balance between specialization and overspecialization. While the former boasts normative standards and rigor in research, the latter carries the risks of monotony and isolation. Watson's narrative, however, is both interesting and accessible since it includes descriptions of people and places not at all relevant to research, highlighting both quirky characters and their insecurities. Therefore, in a period where professional papers outside of one's personal specialty may appear like Greek, works like Watson's memoire remain an important equalizer of knowledge and reminder of the fundamental processes and motivations behind the scientific endeavor. It forces researchers to step away from the nightmare of "publish or perish" if only for a moment, to appreciate the intrinsic motives behind their passion in this line of work in the first place: an insatiable curiosity and drive for discovery.

Thus, the myriad of private information presented in *The Double Helix* offers exclusive information foreign to the scientific manuscript published in *Nature*, a polished report pieced together in a very logical manner, straightforward about its conclusions on the structure of DNA but offering absolutely no insight into the lives of the authors and contributors. Although both works were written by the same person about the same sequence of events, the formal manuscript was devoid of any personal details about the scientists at work and their respective experiences. In accordance with Edgar's statement, scientific publications are often deliberately and carefully assembled to create straightforward theories and hypothesis about the natural world. However, written by the Nobel Laureate himself, Watson describes the process by which one of the most important discoveries was made in *The Double Helix* not as a standalone report but a quirky addition to his professionally published literature. In conjunction with the published manuscript

detailing the molecular structure of deoxypentose nucleic acids, both primary resources make valuable contributions to the collective knowledge about the true nature of discovery, the scientific enterprise, and the multifaceted lives of those who comprise it. Truly, the diversity of both experience and personality within the scientific community elicits no single story. The scientific process cannot be homogenized in simple terms or a process equation. Science seldom proceeds in the straightforward logical manner imagined by outsiders. Instead, there are steps forwards—and backwards too—which lead the inquirer towards the answer, although not without frequent mishaps and adversities along the way. Importantly, although scientific reports should ideally have undergone substantial revision and refinement prior to publication, no perfect paper exists. Rigor in academia posits the necessity for proofing, but such processes are imperfect in themselves. The responsibility lies within all those participating in the process, from the imperfect researchers to the imperfect editors to the readers themselves. Thus, aspiring scholars must hone a critical eye, to not only remain impressed and inspired but also curious and questioning.



My name is Tracey Singer, and I am currently a junior majoring in Biochemistry and Spanish. I would like to pursue medicine in the future, a decision that was strongly influenced by the diverse opportunities and inspirational people I have met here at Mizzou. It is my hope to foster a deeper understanding of the multifaceted nature of science, how it is reported, and its practical translation to medicine in this age of information when media and scientific literacy are more important than ever.

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