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Promoting an ‘Auteur Theory’ for Young Scientists: Preserving Excitement and Creativity...

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Why did we become scientists? Once established (which takes a long time!), we tend to forget or reinvent the initial motivation that drew us into this unusual profession. The frequently stated goals to advance knowledge (disseminated in publications and, on rare occasions, promoted in the popular media) and to potentially benefit our planet and its occupants in the process, mask the human side of the pursuit of science. Francois Jacob described this dichotomy in his autobiography, *The Statue Within* [1], distinguishing what he called ‘night science’ from ‘day science’.

...Day science employs reasoning that meshes like gears, and achieves results with the force of certainty. One admires its majestic arrangement as that of a da Vinci painting or a Bach fugue...

Night science, on the other hand, wanders blindly. It hesitates, stumbles, falls back, sweats, wakes with a start... What guides the mind, then, is not logic. It is instinct, intuition....

It is true for us, and we suspect also the case for many established scientists, that our initial attraction was to the “night science” aspect of scientific pursuit that receives little attention or limelight. In this essay, we focus on the importance of supporting the “night science” view by framing an analogy to the “auteur theory” of filmmaking. We also discuss brief initial thoughts on how such an approach should be promoted in the scientific culture.

In the 1950s and 60s, a group of young film critics and cinephiles drove one of the most influential movements in the history of cinema that became known as French New Wave (*nouvelle vague*). Its core idea was the “auteur theory” [2] laid out by André Bazin and Alexandre Astruc in the 1940s & 50s that the director is the auteur (author) of the film. According to the theory, an auteur uses film as a medium to reflect an individual creative vision. An auteur’s films are therefore recognizable by the distinct signatures of the creator, from the choice of the theme to stylistic elements such as lighting, camerawork, sound, and editing. Virtually all creative activities can, in fact, be described by the auteur theory in that it is the ultimate goal of a creator, be it a musician, a painter, or a novelist, to inscribe her or his intellectual identity on their work.

Scientists who are cinephiles (and there are many) recognize the parallels between filmmaking and doing science. In filmmaking, the director conceives of a film much like a scientist conceives of a project – an initial screenplay or story can be considered analogous to an observation or a specific aspect of the scientific literature that stimulates a scientist to establish a new project. The director typically works with a team of film crew, who understands the director well because they have worked together for a long time, similar to long-term staff in a research lab or institute. The director recruits actors to translate her or his vision, just as a new scientific project depends on the drive and talent of freshly recruited students and postdocs. Shooting a film is very much like doing research, doing experiments (preparing a scene and shooting different takes) and analyzing the data (reviewing the footage). There is a months-long editing process that can transform the same raw footage into radically different final cuts. In modern biological research, the process of writing a paper has become as important as editing is to film, and can take equally long (a fact not always appreciated by students and postdocs who are eager to move on). Throughout these steps there is, in Jacob's elegant wording, blind wandering that is guided by instinct and intuition: in other words, night filmmaking/night science dominate. Such a "night" approach by itself is not sufficient — even in the auteur style, 'day filmmaking/science' remains integral to ensuring that a film/research project reaches a wide audience, which involves critical review (peer review) and distribution (publication, promotion at conferences, and now on Twitter, etc.), activities that fall into the 'day science' category. Successful auteurs/scientists become adept at both, but it is important not to lose sight of the importance of the "night" aspect, which is greatly overshadowed by its flashier half.

Contrasting the auteur style of filmmaking is the approach that dominates current commercial cinema, best exemplified by summer blockbusters or comic book franchises. The origin of this approach has been attributed to the smash successes of *Jaws* and *Star Wars* (both auteur films in their conception and development in the 1970s), and has resulted in a very different style of filmmaking in which deliverables (i.e. ticket sales) dominate the entire process from start to end. Marketing is emphasized to a similar or even greater extent than the filmmaking, and the focus is on dominating the box office for a brief period upon release as well as priming the audience for the next installment in a franchise. Accomplished filmmakers have managed to thrive under this system, using the enormous resources that become available to produce entertaining and skillfully made movies that draw big audiences. Yet this system is self-fulfilling; quoting Jacob, it represents "reasoning that meshes like gears", and is aimed at obtaining "results with the force of certainty" (although not always successfully, as exemplified by numerous major box office flops).

Biological science too has increasingly gravitated towards a blockbuster model, most prominently in fields such as genomics and large-scale systems/omics biology that draw ever-larger resources and attention. As with resource-rich commercial film projects, many such large-scale research projects have had major impact, transforming the pursuit of science by providing new resources (e.g. genome data) that cannot be generated in a small individual lab, and by promoting new technology development. However, this cultural shift has also had a significant impact on the conduct of science: it has tilted resource allocation decisions towards the 'day science' image that is increasingly modeled as the expectation for young scientists. In the end, the auteur film and the blockbuster both need adequate support for

their execution, and this is where the auteur approach is on losing ground unless there is systematic cultural support, as continues to be the case for French cinema.

It is our view that an auteur or individual taste-driven pursuit of science [3] needs broad support and greater promotion within the life sciences research community. In the NIH system, NIGMS has started to support this view, although excessive emphasis on project grants took a toll in the past two decades; this major supporter of discovery in biology in the United States has taken a step in the right direction by developing investigator-focused support programs, with the goal of providing freedom for the pursuit of individual interests. A second important step will be to de-emphasize simple metrics of productivity and instead develop systems to assess depth and originality of individual contributions. This is very challenging, given the sheer volume of scientific literature and the lack of objective criteria. However, it could be promulgated at a departmental level by established faculty encouraging junior colleagues not to worry about publishing “fast and furious” but rather taking the time to develop a deep understanding prior to publication. Departments should also emphasize such a philosophy when making requests for external evaluations at times of promotion, to protect junior faculty from being penalized based on the number of papers published. In the film world, it is not unusual for a writer-director to spend 3–4 years on a screenplay, often put it aside, and restart it several years later. Of course, this is not the sole endeavor of the writer-director and, in both film and science, parallel pursuit of diverse projects is essential for forward movement. There is also one important difference that helps auteur films but is lacking in science -- a professional critical establishment that not only evaluates but also promotes work that lacks the massive marketing campaigns and resources of blockbusters.

In science, peer review that is conducted in private is the major safeguard for quality and significance, but this rarely sees the light of day, and that only if a journal with a policy of publishing reviews accepts a manuscript (thereby providing a skewed view of the overall process). Potentially, scientific journals could nurture a system for critical evaluation after publication, as many are trying to do now with online commenting; but the breadth and volume of the scientific literature, and the lack of a distinction between critics and practitioners, limits utility of current approaches. A radical idea would be for journals/ scientific societies to support the development of professional scientific critics who are not simply promoters of published work, but who provide an experienced critique on recent publications in a specific area. As with film, a critic’s rewards would be in bringing compelling works that lack marketing/profile-driven visibility, to the attention of a wide audience, while also taking to task shoddy resource-intensive work promoted in ‘high profile’ locales. The rise of scientific social media (e.g. Twitter and public blogs) could help with the development of a culture of scientific criticism (and it has to some extent already done so in computational biology). In general, there needs to be more room for true criticism in a public forum -- not just in confidential peer review prior to publication -- and this needs to be considered as an essential part of the scientific enterprise.

It is easy to forecast gloom-and-doom about the current state and the future of science and of filmmaking, but it is important to appreciate that we live in an era when the bag of tricks in both endeavors surpasses anything that came before, and thus opens up our imagination. And the initial attraction to both professions will continue to be the excitement of the blind

wandering that is not logical but driven by instinct and intuition. This is what we need to celebrate and highlight, whenever the opportunity arises.

References

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