Historical Perspective

The liveliest effusion of wit and humor

Jan A. Witkowski

The occurrence and function of humor in biochemistry, and in science in general, is a topic that has been left in the hands of the social scientists for too long. Although some [1] provide interesting perspectives, too often their epistemology of humor within the scientific milieu is, inevitably, of limited scope. Too often, in the course of deconstructing the semiotic architecture of scientific humor, the signifier has been confused with the signified, thus providing no grounds for expecting that we can subjugate our humanity and write about the way the universe is in any relative, laughter-dependent manner.

By contrast, it can be argued that scientists have left the field wide open for others to exploit because they have failed to undertake the critical analysis of humor that they would apply to their research. The present article, similar to my three earlier papers [2–4], is an attempt to put the field of scientific humor on a firm footing, or at least to persuade scientists to take humor seriously, for it is a serious matter with important implications for scientific creativity. Audrey Wells [5], for example, has described the results of research carried out by Vaughan Goddard. He reported that watching a humorous videotape led to higher scores on a creativity test than did watching a videotape of Stephen Hawking's *A Brief History of Time*. It was not reported whether the difference was because the audience for the latter video had fallen asleep.

In the second article of this series [3], I analyzed the occurrence of humor in scientific journals and found that the percentage of humorous and witty articles in biochemistry journals was not statistically different from zero. For the present article, I looked again at scientific publications but now I searched for humor that authors have managed to insert into their papers despite the best efforts of the editorial and review processes to keep such material out of journals.

Authors and acknowledgements
Rather in the fashion of Easter eggs in software programs, strange names or unlikely combinations of names can be hidden in the lists of authors or deep within the acknowledgements – areas that might not be subject to the close scrutiny the rest of the paper receives. It seems a harmless enough prank, although those who carry out citation analyses might feel that it is an irresponsible and childish thing to do.

Fortunately, some scientists do remain children at heart and are willing to tweak the noses of editors, referees and citationologists. The most famous examples come from the pen of George Gamow, the physicist [6]. Gamow was a remarkable man even among the remarkable physicists of the 1930s and 1940s. His most famous contribution was to cosmology with his Big Bang Theory of the origin of the universe and, in 1948, Gamow and his student Ralph Alpher described how the elements came into being in the first moments after the Big Bang. Gamow decided that the paper required a third author, and he persuaded his friend, Hans Bethe, to join them. Thus, 'The Origin of Chemical Elements' was published by Alpher, Bethe and Gamow (α, β, γ) and appeared fortuitously in the 1 April, 1948 issue of the prestigious *Physical Review* journal [7].

Following the publication of the DNA double helix paper in 1953, Gamow became very interested in genetics [8]. Both Watson [9] and Crick [10] have described how they were surprised to receive, out of the blue, a letter from Gamow in which he described how the DNA molecule might be the template on which protein synthesis occurred, amino acids binding directly to the surface of the double helix. Unfortunately, Gamow's 'diamond code' (so-called because the amino acids slotted into diamond-shaped cavities in the DNA helix) ignored some basic facts of biology; for example, the overwhelming evidence that protein synthesis takes place in the cytoplasm and not in the nucleus. Not deterred by facts, Gamow published a brief account of his scheme in *Nature* [11] and wrote-up a longer version for the *Proceedings of the National Academy of Sciences*. The National Academy, as befits the most august scientific institution of the United States, was not amused to find that the paper 'Protein Synthesis by DNA Molecules' was co-authored by C.G.H. Tompkins. Tompkins was the central character of the *Mr. Tompkins…* series of books used by Gamow to describe modern science in an endearing and non-condescending fashion for children and adults. Mr Tompkins' initials were C for the speed of light, G for Newton's Gravitation Constant and H for Planck's Constant. The manuscript was returned to Gamow who promptly sent it off to the Royal Danish Academy, but without Tompkins' name [12].

I have not found many examples published by biologists. Polly Matzinger's co-author on her 1978 *Journal of Experimental Medicine* paper [13] was her cat, Galadriel Mirkwood. (Tolkien fans will recognize an unusual coupling of names – Queen Galadriel, the bearer of the elf-ring Nenya, and Mirkwood, the home to many evil creatures [14].) The editor at the time was not amused and refused to take further papers from Matzinger. Galadriel Mirkwood is not the only animal author of a biology paper. The last author on 'The effects of ALG on the murine immune response to sheep erythrocytes' published in *Immunology*, was one J. Zebra [15]. Henry Wortis tells me that although Joe's current address was listed in this manuscript as 'South Africa', *Immunology* did not print current addresses so there was no clue to alert the reader to the joke. Joe did not have a very distinguished career; indeed, this seems to have been his only publication.

Although the sample size is rather small, it has not escaped my notice that both of these examples are from immunologists. Perhaps immunologists have a higher humor quotient (HQ) than biochemists. It also appears, from correspondence in *New Scientist* in 1997, that physical scientists have a higher HQ than biologists [16].

  PII: S0968-0004(01)01936-3

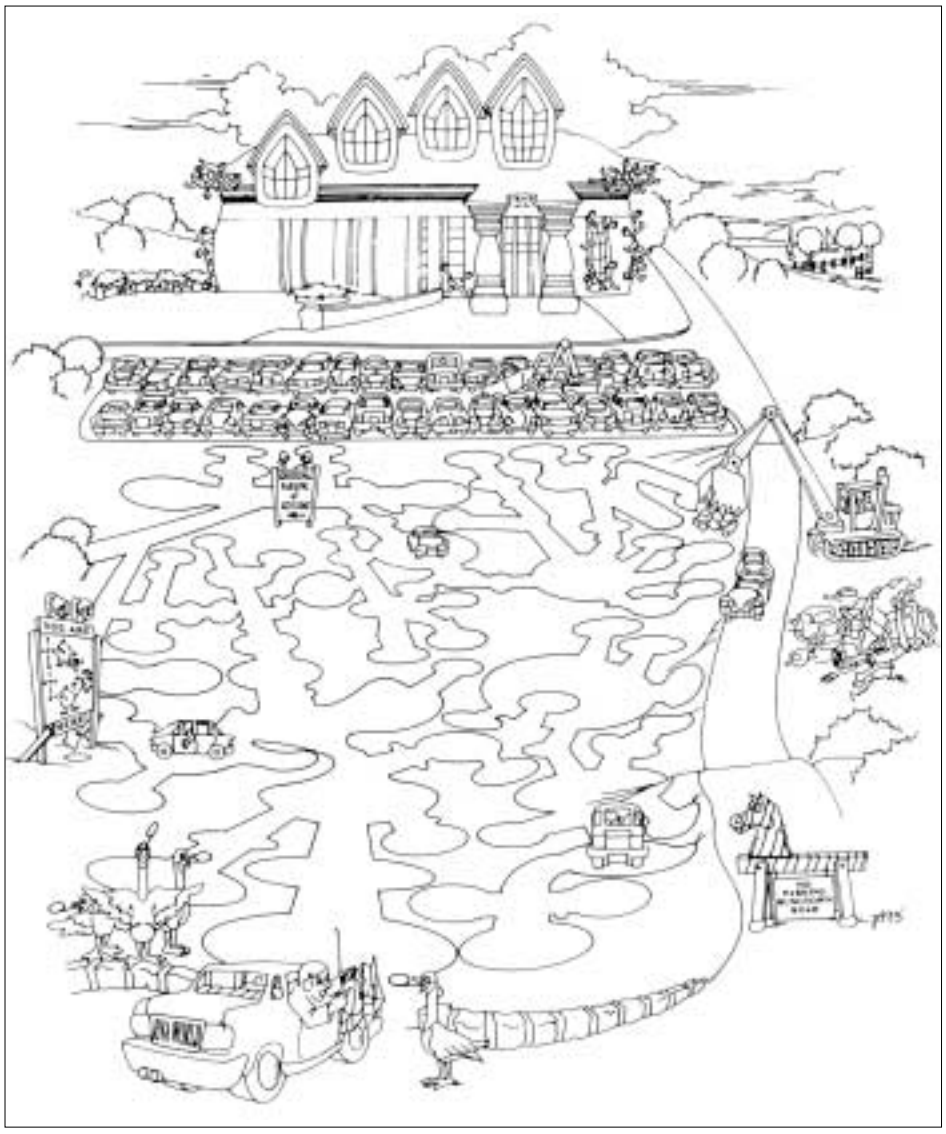


Fig. 1. Cover of abstract book, RNA Processing meeting, Cold Spring Harbor, 1993. Figure courtesy of Jim Duffy, Cold Spring Harbor Laboratory Press.

Among the authors mentioned are:

- Vincent, Van and Gogh – a well-known artist. A subsequent correspondent doubted the editor's assertion that Van was a temporary visitor from Korea whose first names were Moo Ving.
- D. Lindsay, J.A. Howard, E.C. Horswill, L. Iton, K.U. Ingold, T. Cobbley and A. Ll. The paper includes an acknowledgement to Dr T. Pearse – there is an English ballad 'Widdicombe Fair' that begins 'Tom Pearse, Tom Pearse lend me your grey mare' and has the refrain 'Old Uncle Tom Cobbley and All'.
- W.H. Knox, R.S. Knox, J.F. Hoose and R.N. Zare: 'Knock, Knock, Who's There?' – the old children's game.
- A. Quick, V. Browne, S. Fox and P. Hollins, *Surface Science*, 1989: 'Quick Brown Fox' – the first words of the test for typists that uses all the keys on the keyboard. Dr Hollins wrote later explaining that these authors are not fictitious – Browne and Fox were research students and when Quick joined the group, Hollins could not resist adding him to the author list.

Acknowledgements are probably glossed over by editors and reviewers (unless the reviewer expects to be listed there) and make a safe haven for a little gentle humor. Sven Britton, for example, published a paper in the *Journal of Experimental Medicine* in which he thanked John Turk for his assistance in getting the paper published 'in its present form' [17]. Britton had turned to the *Journal of Experimental Medicine* when Turk – then editor of the rival journal *Immunology* – had rejected Britton's paper. (Britton's dedication of his PhD thesis was unusual but more honest than most; it was 'To My Surprise'.)

Text

Whereas the list of authors and the acknowledgements can be easy targets, we might expect it to be more difficult to slip humor into the body of a scientific paper. However, authors are up to the task, as the following examples show.

The single letter amino acid code was devised in 1966 by an informal group led by Richard Eck, and the derivations of the letters are, for the most part, fairly clear [18]. For amino acids with a unique first letter, that letter is used; for example, I for isoleucine, M for methionine and V for valine. For amino acids with common first letters, that letter is used for the most common amino acid – A is used for alanine rather than aspartic acid, and L for leucine rather than lysine. That leaves a set of amino acids with a more cryptic one-letter notation. F for phenylalanine (Fenyalanine) and R for arginine (Rginine) are fairly obvious but why is W the letter for tryptophan? Eck explains this by stating that 'tryptophan' should be pronounced 'twyptophan' and, hence, 'W' is an appropriate symbol for it. The entry has an asterisk against it, leading the reader to a footnote: 'My collaborators insist that I take full responsibility for this – R.V.E.' Unfortunately, this explanation was omitted from later editions and 'W' is now supposed to represent the double ring system in tryptophan.

A sustained game was played on readers of the Cold Spring Harbor Symposia volumes of 1955 and 1956 [19,20]. The participants in both meetings included one J.C. Foothills of the Tennessee Intermountain College, Nazareth, Tennessee. It is interesting that Dr. Foothills attended both meetings as they were on rather different subjects; the 1955 Symposium was on 'Population Genetics' whereas the Symposium one year later was on 'Genetic Mechanisms: Structure and Function'. Foothills was included in the index of the 1955 volume, and the reader is led to a page in Motoo Kimura's paper on population genetics, full of the most impressive and abstruse equations. Inexplicably J.C. Foothills' name does not appear on the page. We are unable to determine even the sex of Foothills because, although Foothills

is listed in the caption to a photograph of Kimura, Emanuel Hackel and Ernst Mayr, he or she appears to have bent down to pick something up, just at the moment the photograph was taken. Foothills is cited in 1956, but this time to a blank page. The entry in the index is unusual and gives the game away to those in the know:
FOOTHILLS, J.C., in, 374
The editor of these volumes was Katherine (Kitty) Brehme Warren, a *Drosophila* geneticist who had prepared Calvin Bridges' 'The mutants of *Drosophila melanogaster*' for publication after Bridges' untimely death at the age of 49 years. She had worked with Milislav Demerec, director of the Carnegie Institution's Dept of Genetics at Cold Spring Harbor, and was now at Hofstra College, not too far away. Kitty was well-known for her mild swearing, particularly the colorful 'Jesus Christ in the foothills!' And so J.C. Foothills assumed a life of his own, and a permanent place in the most prestigious series of publications in molecular biology and genetics [21].

Although a prestigious meeting, the abstracts of the annual RNA Processing meeting do not carry the same weight as the Cold Spring Harbor Laboratory Symposia on Quantitative Biology. This might explain how a curious abstract by A. Aardvark *et al.* came to be published in the abstract book [22] for the 1992 meeting. This was the first year that the RNA processing meeting was held at Keystone, Colorado, rather than at Cold Spring Harbor, because the meeting had outgrown the Cold Spring Harbor facilities, including those for parking. Aardvark (related, perhaps, to Miss Anne Elk whose theory on the brontosaurus is well-known [23]) and his colleagues (including Grace Auditorium, Al Bungtown and Blackford Hall) discuss the vexed issue of RNA parking in the meetingsome at Cold Spring Harbor. The question is raised as to whether the alternative parking site 3′ along Bungtown Road, leads to more efficient assembly of the meetingsome. This question remains unresolved to the present day and, indeed, has become more serious as the size of the meetingsome (especially the genomesome) has increased. Adrian Krainer tells me that he and David Helfman were taken aback to find that the abstract had been published, but Tom Cech, one of the meeting organizers, asked how they could imagine that such an abstract, having been submitted, would *not* be accepted! The following year, the meeting returned to Cold Spring Harbor and the cartoon on the cover of the abstract book – dealing with parking – included a sign that read 'Additional parking at Keystone' (Fig. 1).

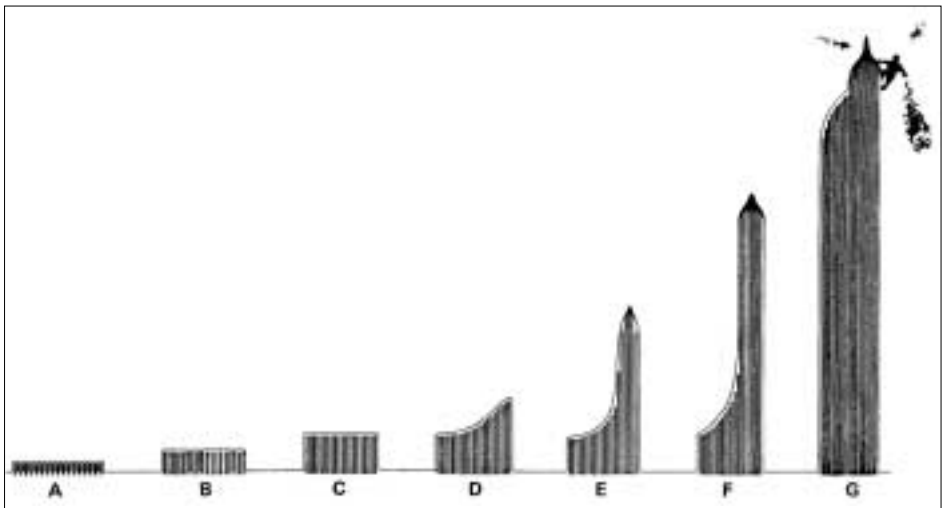


Fig. 13. Summary of development of macrocilia by pattern II. Successive stages are depicted in median longitudinal sections in an aboral–oral sequence (a–o, aboral–oral axis). Vertical lines represent rows of axonemes in profile view. A. Ciliary buds; B, membrane fusion; C, stumps; D, slanted stumps; E, early claws; F, later claws; G, mature macrocilium. Note that the spacing between axonemal rows decreases during development, resulting in a progressive reduction in diameter of the macrocilium from A to G.

Fig. 2. King Kong meets Macrocilia.

Before this section gets too silly, I want to turn to Sidney and Signhild Tamm, biologists in the Marine Biology Program at Boston University who conduct research at the Marine Biology Laboratory at Woods Hole. Sidney Tamm has a penchant for humor and a skill in getting it published. In the funny-things-taken-seriously-category, the Tamms submitted a recipe for Gateau de Mer to the Boston University monthly *BU Link* [24]. The major ingredient is *Bero*' – a ctenophore (i.e. a jelly-fish-like creature). Sidney notes that the editor took the matter seriously, and an accompanying commentary notes that the Tamms have made a special 'cteno-dipper' designed specifically for collecting ctenophores, and that this patented device is available through the Marine Biology Laboratory's gift shop. But perhaps the editorial is as a much tongue-in-cheek as the Tamms' recipe – who can tell what is bluff and double-bluff?

The same is true of one of the more remarkable papers [25] ever published in *Nature*. I have discussed the paper – 'The effects of sexual activity on beard growth in man' – in a previous article [3] but it deserves repeating because of its ambiguous status; is it a genuine paper with a humorous theme, or an outright hoax? The author, who was carrying out research on a remote desert island, reported that his beard began growing more rapidly in the days before he was to be reunited with his girlfriend. Furthermore, maximal growth coincided with maximum sexual activity, although regrettably few details were provided on how that activity was measured. Despite a strong suspicion on the part of readers that the letter was a hoax, *Nature* treated it as a serious contribution to Science, and gave space in subsequent correspondence columns to methodological critiques of the study. The author of the paper did not reveal his identity and my efforts to track him down have led nowhere. I can only repeat my hope that Anon will contact me and reveal the results of the follow-up experiment he was planning. He had argued that an important prediction of his work was that his beard would not show these episodic growth spurts after his marriage, when '…sexual relationships become unpremeditated commonplace activity...'. Thirty-one years of married life should have provided a sufficient number of opportunities to obtain these crucial data unless, regrettably, his estimation of the frequency of sexual interactions was incorrect.

Figures

I have previously discussed the varieties of cartoons used in scientific publications

Table 1. Contents page of *Cool*

Article title	Authors
Minireviews	
Cell-Cell-Cell-Cell-Cell Interactions In Development: An Astonishingly Clever Insight	A molecular biologist
Do Cells Actually Mitose?	Tim and Marc
Motifs as Messages from Our Maker	Ben
TFIID: Does Anyone Out There Care?	Everybody
Book Reviews	
You call this a book?	Author's mother
Finally, he's done with the damn book	Author's family
Articles	
X-Arg-Lys-X: A Novel Motif Conserved In Evolution	A lot of postdocs and a few bigwigs
Same	Different authors
Same	Different authors
tushi: A New Gene Expresssed In Drosphila Posterior Segments	Tubingen mafia
tushi Encodes an EGF-like Zn Finger POU Homeobox HLH Protein, with Tyrosine Kinase Activity	Someone at UCSF
TFIID Is Not Essential for Transcription In Any Cell Type	A big, hot lab
TFIID Is Essential for Transcription In All Cell Types	Their rivals
An Ig Superfamily Member Not Involved In Neuronal Development	Guess who's going to have trouble getting their next grant
LPF: Life Promoting Factor Isolated from *Xenopus Oocytes*	Gosh we're extremely cool
LPF Expressed Everywhere All the Time In All Living Things	And cool biochemists
LPF Is Necessary for Transcription, Translation, and Retrograde Transport from Golgi to ER	Cool cell biologists, also
Identification of LPF as an Amphipathic Protonated Triatomic Molecular Species	Way coolness ensues

[4] but all of these were clearly intended to be amusing and, in many cases, instructional. The inclusion of humor in a serious diagram in a scientific paper is another matter and I have found only one example, from a paper by the Tamms [26]. The paper describes the formation of macrocilia in the ctenophore *Bero*. Macrocilia contain several hundred individual cilia, bound by a single common membrane. They can be formed in two ways: by fusion of fully elongated cilia, and by fusion of ciliate buds with subsequent extension of the cilia. In the latter case, elongation is not uniform; cilia on one side of the bundle stop elongating whereas those on the other side continue to do so, producing a characteristic lop-sided structure. Subsequently, the other cilia elongate until an approximately symmetrical macrocilium is formed. The Tamms summarized the process in a diagram with a remarkable addition to the last part of the figure (Fig. 2).

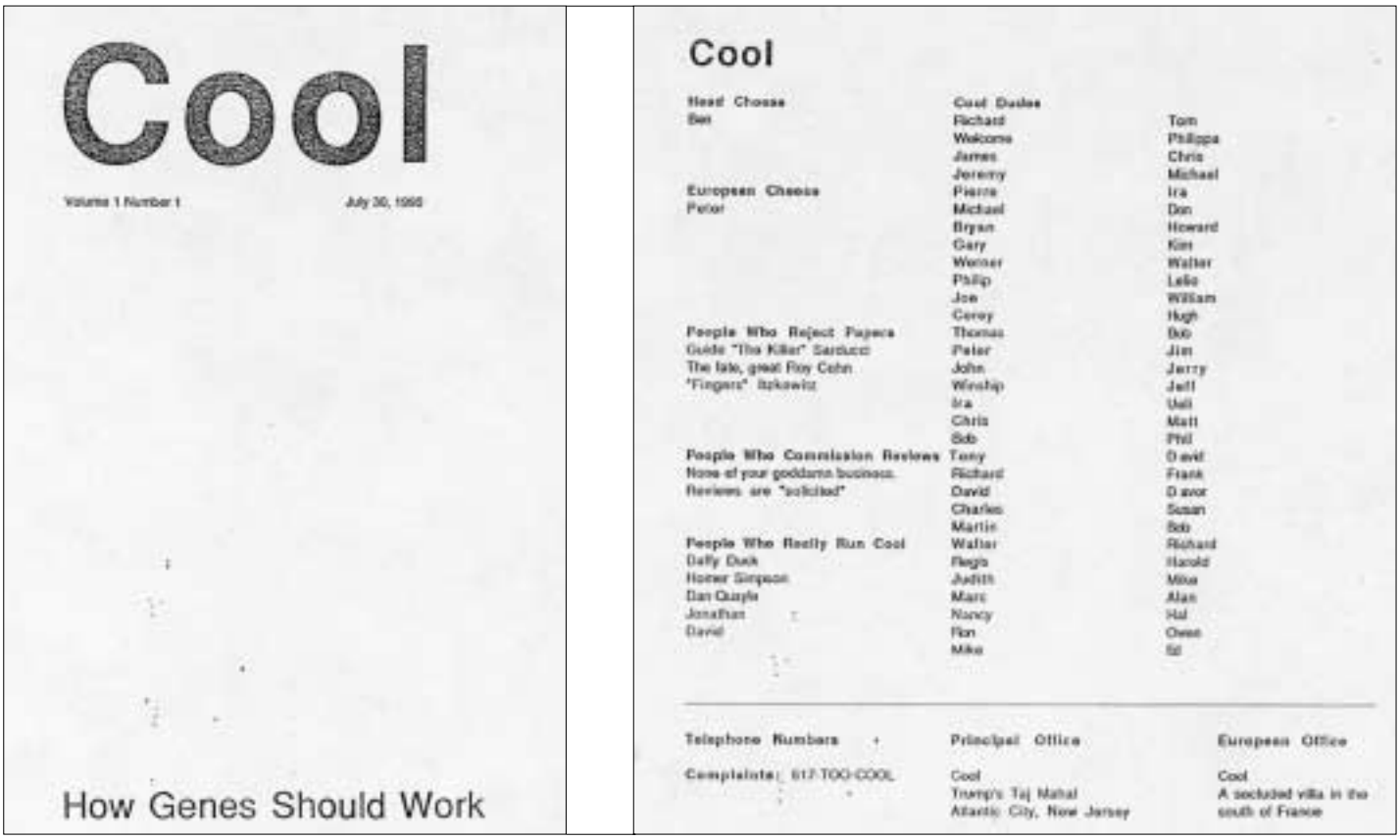
Parody

Parody is a difficult form of humor but it can be very successful, especially when directed against pompous and elitist targets. A parody depends, first, on mimicry; it must capture the essence of the original so that the reader can, with a knowing smile, recognize what is being parodied. Second, the essential features of the original have to be exaggerated so that the reader, in comparing parody and original, sees the ridiculousness of the latter (this is what distinguishes a caricature from a portrait). Furthermore, a successful parody flatters the reader. It suggests that the reader is part of a select group that has the knowledge to see that this is a parody rather than an original. This elite group might be called those-having-inside-knowledge (THIK).

However, the most spectacular parody of recent times – Sokal's paper on 'Transgressing the boundaries: toward a transformative hermeneutics of quantum gravity' in *Social Text* [27] – was especially effective because the experts themselves did not see how ridiculous it was. Sokal's essay was written on an ostensibly erudite topic – 'quantume gravity'; its title contained the buzz words 'transformative' and 'hermeneutics' (the study of the methodological principles of interpretation); and it was full of the phrases and words that pass for knowledge in literary analysis. The editors were so beguiled by topic and language that they could not distinguish rubbish from their own genuine article until the curtain was pulled back. Science does not, I think, have such a remarkable example, despite the fact that the language and jargon of science are as susceptible to parody as those of the social sciences. But there is one scientific paper in which what was intended as a parody was taken seriously.

This was the fate of a short letter that appeared in the 18 April, 1953 issue of *Nature* [28]. The letter was entitled 'Terminology in bacterial genetics' and readers would have given it close scrutiny, given that the first author was Boris Ephrussi [29], the eminent Russian-born geneticist who played a key role in the development of yeast and biochemical genetics. The others included Jean Weigle [30], a leading bacteriophage geneticist, and Urs Leopold [31], who was a pioneer of genetics studies of the fission yeast, *Saccharomyces pombe*. The last signatory was less well-known although he did have an interesting paper in the following week's issue of *Nature* [32].The letter notes the increasing complexity of writings on bacterial genetics (citing, amongst others, a paper by Joshua Lederberg who was notorious for his recondite articles), leading to 'prolix and cavil publications', unintelligible to the non-expert. The authors propose simplifying matters by replacing the terms 'transformation', 'induction', 'transduction' and 'sexual recombination' with the phrase 'inter-bacterial information'. The phrase need not necessarily imply 'the transfer of material substances' (shades here of vitalism) and recognized 'the possible future of cybernetics at the bacterial level'. The letter was, and continues to be, taken seriously [33].

Parodies are especially effective if they include visual as well as textual parody; that is, the design of the original and the parody are the same. One of the most famous – at least for British citizens of a certain age – was the supplement on the Island of Sans Serif published by *The Guardian* on 1 April, 1973. This was a travel feature on an island that looked suspiciously like a horizontal semi-colon and I am sure that travel agents were inundated with enquiries about package holidays there. For a scientific equivalent, we turn to a journal [34] that published, as far as I am aware, only a single issue of three pages, on 30 July, 1990. With the subtitle 'How genes should work', *Cool* was a beautiful parody of *Cell*. *Cool*


Cool

Volume 1 Number 1 July 30, 1990

How Genes Should Work

Cool

Head Cheese
Ben

European Cheese
Peter

People Who Reject Papers
Guido "The Killer" Sarducci
The late, great Roy Cohn
"Fingers" Itzkowitz

People Who Commission Reviews
None of your goddamn business.
Reviews are "solicited"

People Who Really Run Cool
Daffy Duck
Homer Simpson
Dan Quayle
Jonathan
David

Cool Dudes
Richard
Welcome
James
Jeremy
Pierre
Michael
Bryan
Gary
Werner
Philip
Joe
Corey
Thomas
Peter
John
Winship
Ira
Chris
Bob
Tony
Richard
David
Charles
Martin
Walter
Regis
Judith
Marc
Nancy
Ron
Mike

Tom
Philippe
Chris
Michael
Ira
Don
Howard
Kim
Walter
Lelio
William
Hugh
Bob
Jim
Jerry
Jeff
Ueli
Matt
Phil
David
Frank
Davor
Susan
Bob
Richard
Harold
Mike
Alan
Hal
Owen
Ed

Telephone Numbers
Complaints: 617-TOO-COOL

Principal Office
Cool
Trump's Taj Mahal
Atlantic City, New Jersey

European Office
Cool
A secluded villa in the south of France

Fig. 3. Cover and editorial page of *Cool*, a parody of the journal *Cell*, distributed by fax in 1990.

deserves a detailed deconstruction but here I can point out only some of the key features that make it so successful.

Taking mimicry, exaggeration and appeal to the expert in order, *Cool* used exactly the same fonts and layout as *Cell* and, because the style of *Cell* was so distinctive, the reader could identify the target on design alone. Then, the titles of the mini-reviews were typical of *Cell*, as were the topics covered by the articles: protein motifs, *Drosophila* genes, transcription factors, an Ig superfamily protein and a protein factor from *Xenopus*. Clearly, you had to publish in one of these fields to get into *Cool* (or *Cell*). The titles also made fun of *Cell* through imitation; the *Drosophila* paper was on a new gene, *tushi*, being expressed in the posterior segments. (*Drosophila* gene names being what they are, I had to check that there was not a real gene of that name. It does not appear in Medline, but a Google search reveals a paper by Phil Ingham and Peter Gergen on the *runt, hairy, even-skipped* and *tushi tarazu* genes [35]. This is, unfortunately, a misprint.) Remarkably, the Ig superfamily protein was not involved in neuronal development whereas the LPF (life promoting factor) from *Xenopus* was found everywhere and needed for everything.

But, what makes the *Cool* parody so effective is its appeal to THIK, the very people the parody is directed against. For example, the second paper on *tushi* lists the characteristics of the protein encoded by the gene: it is an 'EGF-like Zn Finger POU homeobox HLH Protein, with Tyrosine Kinase activity'; these were favorite research topics of the *Cell* editorial board and they featured repeatedly in the pages of *Cell*. It was not surprising that 'Someone at UCSF' was the author of this paper. The topics also poke fun at what was thought to be cutting edge research; for example, the last of the LPF papers is: 'Identification of LPF as a Amphipathic Protonated Triatomic Molecular Species'. But the most effective tactic to engage THIK comes on the editorial page. Here, the last names of the Head Cheese, European Cheese and the Cool Dudes of the editorial board have been removed. I can add last names to only 43 out of the 64 first names listed, for a rather low CR (coolness rating) of 0.67. Jonathan, a spokesman for the regrettably long-defunct journal, gives me permission to reproduce the editorial page so that readers can take the CR test for themselves and evaluate the success of the mimicry (Fig. 3).

The last example from this very clever production is the description of a cover photograph capturing exactly the type of picture that graced the covers of *Cell*: 'The cover shows a way cool picture, dude, of a chromosome stained with a very cool new dye that really shows almost nothing so it's easy to pick out the really cool stuff. If you still can't see it now, then you're not cool enough for Cool...'

Cool's distribution was rather irregular, the chief mode of delivery being the fax machine. *Cool* was featured in *Science* [36] and played a part in correspondence on the trend towards publishing incomplete research. The editors of *Cool* extolled their time reversal policy; intended for only the coolest papers, it encouraged publication of results before any experiments were done [37].

Conclusions – humor in science

I have discussed scientific humor primarily to counter the popular image of scientists as cold, calculating individuals, who care only for the advancement of science, even at great costs to the rest of society. That scientists have a

well-developed sense of humor is something that should contribute to the 'humanizing' of scientists, for when our sense of humor is tickled, do we not, like everyone else, laugh? Not everyone holds this same view. In 1996, Robert May, then chief scientific adviser to the British Government, warned that the Ig Nobel Prizes, by poking fun at some examples of serious scientific research, could be counterproductive [38]. There is some truth in this, but it will not, I suspect, have such a serious impact on the public perception of science as compared, for example, with the inept handling of the BSE outbreak.

The title of this article is taken from Jane Austen's *Northanger Abbey* [39]. Austen writes that although novels are considered mere trifles and not taken seriously, in fact they contain 'the most thorough knowledge of human nature, the happiest delineation of its varieties, the liveliest effusion of wit and humour...' In science we are faced with the reverse – we have serious writings that, seemingly, dare not occasionally deal with trifles or humor. What can be done to improve this sad state of affairs? Rather little, I am afraid, until the editorial boards of serious journals take more seriously their responsibilities for improving the lives of their readers. But until then, let us rejoice in the work of those brave scientists who, against all the odds, manage to introduce the sound of laughter into the serious, silent halls of academia.

Acknowledgements

I thank correspondents who have brought interesting studies to my attention. They include Sven Britton, David Helfman, Adrian Krainer, Polly Matzinger, Waclaw Szybalski, Sidney Tamm, Jim Watson, Henry Wortis and the editors of *Cool*.

References

1 Gilbert, G.N. and Mulkay, M. (1984) *Opening Pandora's Box: a sociological analysis of scientists' discourse*, Cambridge University Press
2 Witkowski, J.A. (1995) How I learned to stop worrying and love Cell. *Trends Biochem. Sci.* 20, 163–168
3 Witkowski, J.A. (1996) 'Nothing to laugh at at all': humor in biochemical journals. *Trends Biochem. Sci.* 21, 156–160
4 Witkowski, J.A. (1997) Deconstructing the flowing line: cartoons in biochemistry. *Trends Biochem. Sci.* 22, 142–146
5 Wells, A. (1997) Humour should be taken seriously. *Nature* 386, 14
6 Segre, G. (2000) The Big Bang and the genetic code. *Nature* 404, 437
7 Alpher, R.A. *et al.* (1948) The origin of chemical elements. *Phys. Rev.* 73, 803–804
8 Hayes, B. (1998) The invention of the Genetic Code. *Am. Sci.* 86, 8–14
9 Watson, J.D. (2001) *Genes, girls and Gamow*, Oxford University Press
10 Crick, F.H.C. (1988) *What Mad Pursuit*, Basic Books, New York, USA
11 Gamow, G. (1954) Possible relation between deoxyribonucleic acid and protein structures. *Nature* 173, 318
12 Gamow, G. (1954) Possible mathematical relation between deoxyribonucleic acid and protein. *Kgl. Dansk. Videnskab. Selskab. Biol. Medd.* 22, 1–13
13 Matzinger, P. and Mirkwood, G. (1978) In a fully H-2 incompatible chimera, T cells of donor origin can respond to minor histocompatability antigens in association with either donor for host H-2 type. *J. Exp. Med.* 148, 84–92
14 Tolkien, J.R.R. (1954) *The Fellowship of the Ring*, Allen & Unwin, London, UK
15 Anderson, H.R. *et al.* (1972) The effects of ALG on the murine immune response to sheep erythrocytes. *Immunology* 22, 277–289
16 New Scientist 4 January 1997; 8 February 1997; 1 November 1997; 22 November 1997
17 Britton, S. (1969) Regulation of antibody synthesis against *Escherichia coli* endotoxin. IV. Induction of paralysis *in vitro* by treating normal lymphoid cells with antigen. *J. Exp. Med.* 129, 469–482
18 Eck, R.V. (1966) One- and three letter amino acid abbreviations: mneumonics of the one-letter notation. In *Atlas of Protein Sequence and Structure* (Eck, R.V. and Dayhoff, M.O., eds), xiii, National Biomedical Research Foundation
19 Demerec, M., ed. (1955) Population genetics: the nature and causes of genetic variability in natural populations. *Cold Spring Harbor Symp. Quant. Biol.* XX, 1–346
20 Demerec, M., ed. (1956) Genetic mechanisms: structure and function. *Cold Spring Harbor Symp. Quant. Biol.* XXI, 1–392
21 Witkowski, J.A. (1990) The 51 most-cited articles in the Cold Spring Harbor Symposia on Quantitative Biology. *Curr. Contents* 28, 7–17
22 Aardvark, A. *et al.* (1992) Alternative RNA parking on Bungtown Road. In *RNA Processing: Program and Abstracts*, p. 16
23 Monty Python (1973) Monty Python's Previous Record. Miss Anne Elk. The Other Side, track 3. Buddah Records
24 Tamm, S.L. and Tamm, S. (1990) Holiday observances and recipes from the University's international community – Gateau de Mer. *BU Link: December*
25 Anon (1970) Effects of sexual activity on beard growth in man. *Nature* 226, 869–870
26 Tamm, S.L. and Tamm, S. (1988) Development of macrociliary cells in *Bero*. II. Formation of macrocilia. *J. Cell Sci.* 89, 81–95
27 Sokal, A. (1996) Transgressing the boundaries: toward a transformative hermeneutics of quantum gravity. *Social Text* 46/47, 217–252
28 Ephrussi, B. *et al.* (1953) Terminology in bacterial genetics. *Nature* 171, 701
29 Roman, H. (1980) Boris Ephrussi. *Annu. Rev. Genet.* 14, 447–450
30 Weigle, J. (1966) Story and structure of the λ transducing phage. In *Phage and the Origins of Molecular Biology*, pp. 226–235, Cold Spring Harbor Laboratory Press (reprinted with additional material, 1992)
31 Leupold, U. (1993) The origin of *Schizosaccharomyces pombe* genetics. In *The Early Days of Yeast Genetics* (Hall, M.N. and Linder, P., eds), pp. 125–128, Cold Spring Harbor Laboratory Press
32 Watson, J.D. and Crick, F.H.C. (1953) A structure for deoxyribose nucleic acid. *Nature* 171, 737–738
33 Sakar, S. (1996) Decoding 'coding' – information and DNA. *Bioscience* 46, 857–864
34 Anon (1990) *Cool*
35 Ingham, P. and Gergen, P. (1988) Interactions between the pair-rule genes runt, hairy, even-skipped and tushi (sic) tarazu and the establishment of periodic pattern in the *Drosophila* embryo. *Development* 104, 51–60 [as cited by Yua, Y. *et al.* (1999) A double interaction screen identifies positive and negative ftz gene regulators and Ftz-interacting proteins. *Mech. Dev.* 83, 95–105]
36 Hamilton, D.P. (1990) Biologists madly fax a Cool new journal. *Science* 249, 1102–1103
37 Jonathan and David (1991) *Science* 251, 1005
38 Nadis, S. (1996) U.K. chief scientist warns of risks of 'Ig Nobel' ridicule. *Nature* 383, 291
39 Austen, J. (1818) *Northanger Abbey* John Murray, London

Jan A. Witkowski
Banbury Center, Cold Spring Harbor Laboratory, Cold Spring Harbor, NY 11724 0534, USA.
e-mail: witkowsk@cshl.org