ative laser of that kind, and by the degree of effort that had been required by the Bell Laboratories workers to make their operative helium-neon laser. Gould appealed this decision to the courts but never followed through, and his suit was ultimately dismissed with prejudice.

Almost contemporaneously, the Patent Office had set up an interference between the Gould application and an application of Hellwarth of Hughes Aircraft with respect to priority of claims to a Q-switched laser. The Gould application had also proposed the Q-switched form of laser. In this contest, Hellwarth maintained that the Gould application had insufficient disclosure to permit an ordinary worker in the art to build a Q-switched laser without undue experimentation, because it failed to teach how to build an operative laser. After a lengthy proceeding, the Court of Customs and Patent Appeals (*21*) agreed with Hellwarth's argument, still influenced by the difficulty TRG had experienced in building an operative laser.

Despite these setbacks, Gould continued his efforts to secure a U.S. patent and on 11 October 1977 he was issued U.S. Patent No. 4,053,845, entitled "Optically Pumped Laser Amplifiers." The issue of this patent has been the subject of much discussion because the expiration of the Townes, Bloembergen, and Schawlow-Townes patents in 1976 and 1977 was thought to mark the expiration of broad, basic patents in the field. Not surprisingly, this patent is already involved in litigation.

It is not the intent of this note to comment in any way on the legal aspects—scope and validity—of the Gould patent. These questions are more properly addressed in litigation which is apt to be prolonged, and it seems appropriate to await the results of this litigation before assessing the impact of this patent. Rather, it is the intent here to show the scientific perspective and evolution of laser technology and to identify the more important contributors to this development.

A. J. TORSIGLIERI
W. O. BAKER

Bell Laboratories, 600 Mountain Avenue, Murray Hill, New Jersey 07974

References and Notes

1. R. C. Tolman, *Phys. Rev.* **23**, 693 (1924).
2. V. A. Fabrikant, *Tr. Vses. Elektrotekh. Inst.* **41**, 254 (1940).
3. W. E. Lamb, Jr., and R. C. Retherford, *Phys. Rev.* **79**, 549 (1950).
4. E. M. Purcell and V. Pound, *ibid.* **81**, 279 (1951).
5. H. Friedburg and W. Paul, *Naturwissenschaften* **38**, 159 (1951).
6. J. Weber, *IRE Trans. Electron Devices* **3**, 1 (1953).
7. N. G. Basov and A. M. Prokhorov, *J. Exp. Theor. Phys.* **27**, 431 (1954).
8. A. Combrisson, J. Honig, C. H. Townes, *C. R. Acad. Sci.* **242**, 2451 (1956).
9. N. G. Basov and A. M. Prokhorov, *Zh. Eksp. Teor. Fiz.* **28**, 249 (1955).
10. N. G. Basov and B. D. Osipov, *Opt. Spektrrosk.* **4**, 795 (1958).
11. N. Bloembergen, *Phys. Rev.* **104**, 324 (1956).
12. H. E. D. Scovil, G. Feher, H. Seidel, *ibid.* **105**, 762 (1957).
13. U.S. Patent No. 2,851,652, filed 21 May 1956, issued 9 September 1958.
14. N. G. Basov, *Radiotekh. Elektron.* **3**, 297 (1958); A.M. Prokhorov, *Zh. Eksp. Teor. Fiz.* **34**, 1658 (1958).
15. A. L. Schawlow and C. H. Townes, *Phys. Rev.* **112**, 1940 (1958).
16. In most countries of the world, the first to file a patent application automatically becomes, legally, the first inventor—absent derivation, but in the United States it is possible through an interference proceeding for an applicant who filed later to be declared the first inventor by proving an earlier date of invention. Invention dates are proved by corroborated evidence of conception, reduction to practice, and, in certain cases, by diligence of the inventor.
17. Gould *v.* Schawlow and Townes, 53 *Ct. Cust. Pat. Appeals Rep.* 1403 (1966); 150 *U.S.Pat.Q.* 634 (1966).
18. T. H. Maiman, *Br. Commun. Electron.* 7, 674 (1960).
19. A. Javan, W. R. Bennett, Jr., D. R. Herriott, *Phys. Rev. Lett.* **6**, 106 (1961).
20. Issued 19 October 1971 as U.S. Patent No. 3,614,633.
21. Gould *v.* Hellwarth, 176 *U.S.Pat.Q.* 515 (1973).

Dickens on Statistics

I write with footnotes to June Goodfield's interesting account (11 Nov. 1977, p. 580) of Charles Dickens' antipathy to science—and in particular to statistics. As Goodfield says, Dickens' dislike of statistics arose from his view that statistical treatment of social questions dehumanized human beings and regarded them "solely as numbers in a statistical equation."

First, the humanistic criticism of statistics just summarized is described in my survey article (*1*), with several examples, and with discussion from the viewpoint of one all too human a statistician.

Second, the magazine *Bentley's Miscellany* was not the only vehicle for Dickens' roundhouse swings at statistics. His novel *Hard Times* comments on "gloomy statistical dens" in chapter 3, and on a "deadly statistical clock" in chapter 15; it has similar passages elsewhere.

Hard Times was first published in 1854 in *Household Words*, a journal that Dickens started . . . and ended after a dispute with his publisher.

Third, in the same journal, *Household Words*, there is at least one place where Dickens finds statistics helpful. In the issue of 3 April 1852 (volume 5), Dickens (with Henry Morley) published an article, "Drooping buds." It celebrates the opening of the first children's hospital in London, the Hospital for Sick Children. Dickens and Morley describe in heart-chilling terms the prior absence of adequate medical care. On page 46, there is reference to a committee of the Statistical Society that found in 1843 only 1 out of 100 hospital inmates to be a child with an internal disease. (The inference is that children with internal diseases rarely got to a hospital and died with tragic frequency.) "Drooping buds" is reprinted in (*2*); see also (*3*).

In the medical area one finds perhaps the most perplexing interplay between claims of humanity and those of science in a narrow sense. Let me congratulate *Science* on the treatment of that interplay in the publication of the Birnbaum memorial symposium in the issue of 18 November 1977.

WILLIAM KRUSKAL

Department of Statistics, University of Chicago, Chicago, Illinois 60637

References

1. W. H. Kruskal, in *International Encyclopedia of the Social Sciences* (Macmillan and Free Press, New York, 1968), vol. 15, pp. 206–224.
2. H. Stone, *Uncollected Writings from Household Words* (Indiana Univ. Press, Bloomington, 1968).
3. A. Lohrli, *Household Words, A Weekly Journal, 1850–1859, Conducted by Charles Dickens* (Univ. of Toronto Press, Toronto, 1973).

Health and Habit

Anselm L. Strauss, in his letter (10 Feb., p. 597) regarding John H. Knowles' recent editorial "Responsibility for health" (16 Dec. 1977, p. 1103) makes the statement, "Those who suffer from [cancer, heart disease, diabetes, back disease, arthritis, and chronic respiratory illness] have not chosen them, and medical science can do little more than make palliative gestures on behalf of the sufferers."

Rather brief experience in caring for patients would have quickly led any observer to the conclusion that the patients indeed have played a strong role in choosing the diseases mentioned by smoking, overeating, and not exercising, which aggravate the diseases.

Through individual habit and will, it is possible for the patient to alter these conditions. This is not the responsibility of society or government but rather that of the individual. Currently, many patients, including members of the "white, well-educated, and affluent middle class," refuse to accept this responsibility even when it is forcefully pointed out to them after they develop these chronic illnesses.

BRUCE R. ZIMMERMAN

Endocrinology and Internal Medicine, Mayo Clinic, Rochester, Minnesota 55901