

## **GRAEME CLARK'S BIBLIOGRAPHY OF THE MOST IMPORTANT PUBLICATIONS**

### **Books**

Clark GM. (2003) Cochlear Implants: Fundamentals and Applications. Springer-Verlag, New York. (The first textbook on the cochlear implant, a major 800 page work written solely by Clark)

Clark GM. (2000) Sounds from Silence. Allen & Unwin, Sydney. (Clark's Autobiography)

### **Invited Reviews**

Clark GM (2008) Personal reflections on the multichannel cochlear implant and a view of the future. *Journal of Rehabilitation Research & Development*. 45: (5), 651-693, 2008 (Clark was invited to write the lead review in this special issue of the journal devoted to cochlear implants: all other papers are by US scientists)

Clark GM (2006) The multiple-channel cochlear implant: the interface between sound and the central nervous system for hearing, speech, and language in deaf people- a personal perspective. *Philosophical Transactions of the Royal Society B*. 361: 791-810, 2006 (A special invitation for Clark after his presentation on being made a Fellow of the Royal Society)

Clark GM. (1995). Cochlear implants: historical perspectives. *Profound deafness and communication*. Plant G and Spens K.-E eds. London, Whurr: 165-218. (Written by Clark in honour of Arne Risberg, on his retirement from the Royal Institute of Technology, Stockholm.

### **Scientific Papers**

1. Clark GM. (1969) Responses of cells in the superior olivary complex of the cat to electrical stimulation of the auditory nerve. *Experimental Neurology* 24: 124-136. (The first neurophysiological study of brainstem responses to electrical stimulation, and their relevance to the processing of speech sounds)
2. Clark GM, Kranz HG, Minas H. (1973) Behavioral thresholds in the cat to frequency modulated sound and electrical stimulation of the auditory nerve. *Experimental Neurology* 41: 190-200 (One of a set of three papers by Clark that were the first to report on the behavioural response of the animal to electrical stimulation)
3. Clark GM, Hallworth RJ, Zdanius K. (1975), A cochlear implant electrode. *Journal of Laryngology and Otology* 89: 787-792. (The first report on the bio-mechanics of an electrode insertion into the human cochlea)
4. Williams AJ, Clark GM, Stanley GV. (1976), Pitch discrimination in the cat through electrical stimulation of the terminal auditory nerve fibers. *Physiological Psychology* 4: 23-27. (The first report using conditioned responses that animals could discriminate high from low frequencies)

5. Clark GM, Tong YC, Black RC, Forster IC, Patrick JF, Dewhurst DJ. (1977), A multiple electrode cochlear implant. *Journal of Laryngology and Otology* 91 :935-945. (The first report on the design of an implantable multi-channel receiver-stimulator)
6. Clark GM. (1977) An evaluation of per-scalar cochlear electrode implantation techniques. An histopathological study in cats. *Journal of Laryngology and Otology* 91: 185-199. (The first study evaluating the histopathological effects of different sites of electrode insertion)
7. Clark GM, Tong YC, Bailey QR, Black RC, Martin LF, Millar JB, O'Loughlin BJ, Patrick JF, Pyman BC. (1978) A multiple-electrode cochlear implant. *Journal of the Oto-Laryngological Society of Australia* 4: 208-212. (The first report of a second formant/voicing speech processing strategy for understanding speech with a multi-channel cochlear implant)
8. Clark GM, Patrick JF, Bailey QR. (1979), A cochlear implant round window electrode array. *Journal of Laryngology and Otology* 93: 107-109. (The first report of a banded electrode array and its advantages for insertion into the cochlea)
9. Clark GM, Pyman BC, Bailey QR. (1979) The surgery for multiple-electrode cochlear implantations. *Journal of Laryngology and Otology* 93: 215-223. (The first report of the surgery for a multi-channel cochlear implant)
10. Tong YC, Black RC, Clark GM, Forster IC, Millar JB, O'Loughlin BJ, Patrick JF. (1979) A preliminary report on a multiple-channel cochlear implant operation. *Journal of Laryngology and Otology* 93: 679-695. (The first report of vowel recognition with place of stimulation and its relation to single formant excitation of the same region of the cochlea)
11. Tong YC, Millar JB, Clark GM, Martin LF, Busby PA. Patrick JF (1980) Psychophysical and speech perception studies on two multiple-channel cochlear implant patients. *Journal of Laryngology and Otology* 94: 1241-1256. (The first analysis of the speech features being transmitted with second formant/ voicing strategy on two patients)
12. Clark GM, Tong YC, Martin LF, Busby PA. (1981), A multiple-channel cochlear implant. An evaluation using an open-set word test. *Acta Oto-Laryngologica* 91: 173-175. (The first open-set word scores obtained under controlled and standardized conditions showing that the patients could understand running speech both with lipreading and electrical stimulation alone –received 8th April 1980 for publication in April 1981).

13. Clark GM, Tong YC, Martin LF. (1981) A multiple-channel cochlear implant. An evaluation using open-set CID sentences. *Laryngoscope* 91: 628-634.  
(The first open-set word-in-sentence scores obtained under controlled and standardized conditions showing that the patients could understand running speech both with lipreading and electrical stimulation alone –publication, April 1981).
14. Tong YC, Clark GM, Blamey PJ, Busby PA, Dowell RC. (1982), Psychophysical studies for two multiple-channel cochlear implant patients. *Journal of the Acoustical Society of America* 71: 153-160.  
(The first systematic report of sharpness and dullness for place of stimulation and the first report of the perception of frequency glides for place and rate of stimulation of relevance to consonant recognition and voicing of speech)
15. Tong YC, Dowell RC, Blamey PJ, Clark GM. (1983) Two-component hearing sensations produced by two-electrode stimulation in the cochlea of a deaf patient. *Science* 219: 993-994.  
(The first discovery that two stimuli presented on a place coding basis can be perceived as having two perceptual components)
16. Clark GM, Shepherd RK. (1984) Cochlear implant round window sealing procedures in the cat. *Acta Oto-Laryngologica Suppl* 410: 5-15.  
(The first report on sealing the electrode entry to the inner ear to prevent inner ear infection and meningitis)
17. Tong YC, Clark GM. (1985), Absolute identification of electric pulse rates and electrode positions by cochlear implant patients. *Journal of the Acoustical Society of America* 77: 1881-1888.  
(The first report on the spatial separation between electrode pairs and the extent of the bipolar pairs on place coding of frequency)
18. Blamey PJ, Martin LF, Clark GM. (1985) A comparison of three speech coding strategies using an acoustic model of a cochlear implant. *Journal of the Acoustical Society of America* 77: 209-217.  
(The first discoveries mimicking speech coding strategies with multi-channel electrical stimulation using an acoustic model in hearing subjects)
19. Shepherd RK, Clark GM, Pyman BC, Webb RL. (1985), Banded intracochlear electrode array: Evaluation of insertion trauma in human temporal bones. *Annals of Otology, Rhinology and Laryngology* 94: 55-59.  
(The first histological safety studies on the insertion of the smooth, tapered, free-fitting banded array into the human cochlea)

20. Tong YC, Clark GM. (1986), Loudness summation, masking, and temporal interaction for sensations by electric stimulation of two sites in the human cochlea. *Journal of the Acoustical Society of America* 79: 1958-1966.  
(The first study on 1) spatial separation of electrodes, and loudness; and 2) the discrimination of temporal delays between two interleaving pulse trains of importance in understanding brain coding mechanisms and speech processing )
21. Dowell RC, Mecklenburg DJ, Clark GM (1986) Speech recognition for 40 patients receiving multichannel cochlear implants. *Archives of Otolaryngology* 112: 1054-1059.  
(The first results showing the communication skills with the second formant/voicing speech strategy in a population of severely deaf people and presented to the FDA)
22. Dowell RC, Seligman PM, Blamey PJ, Clark GM. (1987) Speech perception using a two-formant 22-electrode cochlear prosthesis in quiet and in noise. *Acta Oto-Laryngologica* 104(5-6): 439-446.  
(The first report of speech results for a processor coding the second and first formant/voicing strategy)
23. Xu S, Dowell RC, Clark GM. (1987). Results for Chinese and English in a multichannel cochlear implant patient. *Annals of Otology, Rhinology and Laryngology*. 96: 126-127.  
(The first report in the literature of the benefits of the second formant/voicing strategy for a tonal language)
24. Clark GM, Busby PA, Roberts SA, Dowell RC, Tong YC, Blamey PJ, Nienhuys TGW, Mecklenburg DJ, Webb RL, Pyman BC, Franz BK-HG. (1987) Preliminary results for the Cochlear Corporation multi-electrode intracochlear implants on six prelingually deaf patients. *American Journal of Otology* 8: 234-239.  
(The first and early report of the benefits of the second-first formant/voicing strategy for children born deaf or deafened early in life)
25. Franz BK-HG, Clark GM, Bloom DM. (1987) Effect of experimentally induced otitis media on cochlear implants. *Annals of Otology, Rhinology and Laryngology* 96 (2): 174-177.  
(The first report on the histopathological response of the electrode sheath that facilitates three defense mechanisms to limit the spread of middle ear infection to the inner ear).
26. Clark GM, Shepherd RK, Franz BK-HG, Dowell RC, Tong YC, Blamey PJ, Webb RL, Pyman BC, McNaughton J, Bloom D, Kakulas BA, Siejka S. (1988), The histopathology of the human temporal bone and auditory central nervous system following cochlear implantation in a patient. Correlation with psychophysics and speech perception results. *Acta Oto-Laryngologica (Suppl 448)*: 1-65.  
(The first report of the effects of the multi-channel banded electrode and electrical stimulation on the temporal bone of a deaf person; the results were analysed in relation to pathology, neural elements in the cochlea and brain and perception)

27. Dawson P, Blamey PJ, Clark GM, Busby PA, Rowland LC, Dettman SJ, Brown AM, Dowell RC, Rickards FW, Alcantara JI. (1989) Results in children using the 22 electrode cochlear implant. *Journal of the Acoustical Society of America* 86(Suppl 1): 81.

(The first report of the benefits of multi-channel cochlear implant speech processing for implanted children)

28. Tong, Y.C., van Hoesel, R., Lai, W.K., Vandali, A., Harrison, J.M. & Clark, G.M. (1990), Speech processors for auditory prostheses. Sixth Quarterly Progress Report, June 1 - August 31, NIH Contract No1-DC-9-2400.

(The first report on the use of constant rate of stimulation and amplitude variations to convey voicing)

29. McKay CM, McDermott HJ, Clark GM. (1991), Preliminary results with a six spectral maxima speech processor for The University of Melbourne/Nucleus multiple electrode cochlear implant. *Journal of the Oto-Laryngological Society of Australia* 6: 354-359.

(The first objective results showing an improvement in speech processing with a spectral maxima speech processor)

30. van Hoesel R, Tong YC, Hollow RD, Huigen J, Clark GM. (1990), Preliminary studies on a bilateral cochlear implant user. (120th Meeting Acoustical Society of America, San Diego, California, 26-30 November 1990) *Journal of the Acoustical Society of America* 88 (Suppl 1): S193.

(The first discovery of the benefits of bilateral multi-channel cochlear implants)

31. van Hoesel R, Tong YC, Hollow RD, Clark GM. (1993), Psychophysical and speech perception studies: a case report on a binaural cochlear implant subject. *Journal of the Acoustical Society of America* 94: 3178-3189.

(The first systematic research study showing the benefits of multi-channel bilateral stimulation)

32. Dooley GJ, Blamey PJ, Seligman PM, Alcantara JI, Clark GM, Shallop JK, Arndt P, Heller JN, Menapace CM. (1993), Combined electrical and acoustical stimulation using a bimodal prosthesis. *Archives of Otolaryngology - Head and Neck Surgery* 119: 55-60.

(The first report on the benefits of Bimodal speech processing i.e. a cochlear implant in one ear and a hearing aid in the other)

33. Busby PA, Whitford LA, Blamey PJ, Richardson LM, Clark GM. (1994), Pitch perception for different modes of stimulation using the Cochlear multiple-electrode prosthesis. *Journal of the Acoustical Society of America* 95: 2658-2669.

(The first comparison of modes of stimulation to localize electrical current, and the discovery this could be done with mono-polar stimulation)

34. Dahm M, Clark GM, Franz BK-HG, Shepherd RK, Burton MJ. (1994) Cochlear implantation in children: labyrinthitis following pneumococcal otitis media in unimplanted and implanted cat cochleas. *Acta Oto-Laryngologica* 114: 620-625.  
(The first definitive finding on the importance of a seal at the electrode entry against pneumococcal meningitis)
- 35 van Hoesel RJM, Clark GM. (1995), Fusion and lateralization study with two binaural cochlear implant patients. *Annals of Otology, Rhinology and Laryngology* 104 (Suppl 166): 233-235.  
(The first psychophysical study showing the bilateral cochlear implant is of general benefit)
36. Vandali A, Harrison JM, Huigen J, Plant K, Clark GM. (1995), Multichannel cochlear implant speech processing: further variations of the Spectral Maxima sound processor strategy. *Annals of Otology, Rhinology and Laryngology* 104 (Suppl 166): 378-381.  
(The first report that emphasizing the frequency transients of speech provided improved recognition)
37. Skinner MW, Clark GM, Whitford LA, Seligman PM, Staller SJ, Shipp DB, Shallop JK, Everingham C, Menapace CM, Arndt P, Antogenelli T, Brimacombe JA, Daniels P, McDermott HJ, Beiter AL. (1994) Evaluation of a new spectral peak coding strategy for the Nucleus 22 channels cochlear implant system. *American Journal of Otology* 15: 15-27.  
(The first results of an international trial of the spectral maxima speech processor)
- 38 Clark GM. (1995), Cochlear implants: future research directions. *Annals of Otology, Rhinology and Laryngology* 104 (Suppl 166): 22-27.  
(Clark's vision for future cochlear implant research directions)
39. Blamey PJ, Dooley GJ, Parisi ES, Clark GM. (1996), Pitch comparisons of acoustically and electrically evoked auditory sensations. *Hearing Research* 99: 139-150.  
(The first study showing the site of place pitch with electrical stimulation is offset from that for acoustic excitation of hair cells in an intact cochlea)
40. van Hoesel RJM, Clark GM. (1997), Psychophysical studies with two binaural cochlear implant subjects. *Journal of the Acoustical Society of America* 102: 495-507.  
(The first systematic research on the psychophysics of bilateral cochlear implants and speech perception)
41. van Hoesel RJM, Clark GM. (1999), Speech results with a bilateral multi-channel cochlear implant subject for spatially separated signal and noise. *Australian Journal of Audiology* 21: 23-28.  
(The first report of the benefits of bilateral cochlear implants with speech presented from one speaker and noise from the other (spatially separated), showing that the person attends to the side where perceptually the signal-to-noise ratio is the better)

42. Busby PA, Clark GM. (2000), Pitch estimation by early-deafened subjects using a multiple-electrode cochlear implant. *Journal of the Acoustical Society of America* 107: 547-558.

(A key study of Busby and Clark's showing the factors responsible for the development of auditory perceptual skills and speech recognition in deaf children)

43. Chen BK, Clark GM, Jones R (2003) Evaluation of trajectories and contact pressures for the straight nucleus cochlear implant electrode array – a two-dimensional application of finite element analysis. *Medical Engineering and Physics* 2: 141-147.

(The first finite element modelling of the stress strain of electrodes inserted into the cochlea confirming that an electrode with flexible tip and increasing stiffness results in least pressure on the cochlear wall)