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Alexander J. Ellis and His Place in the History of Ethnomusicology

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The musical scale is not one, not "natural," not even founded necessarily on the laws of the constitution of musical sound so beautifully worked out by Helmholtz, but very diverse, very artificial, and very capricious.

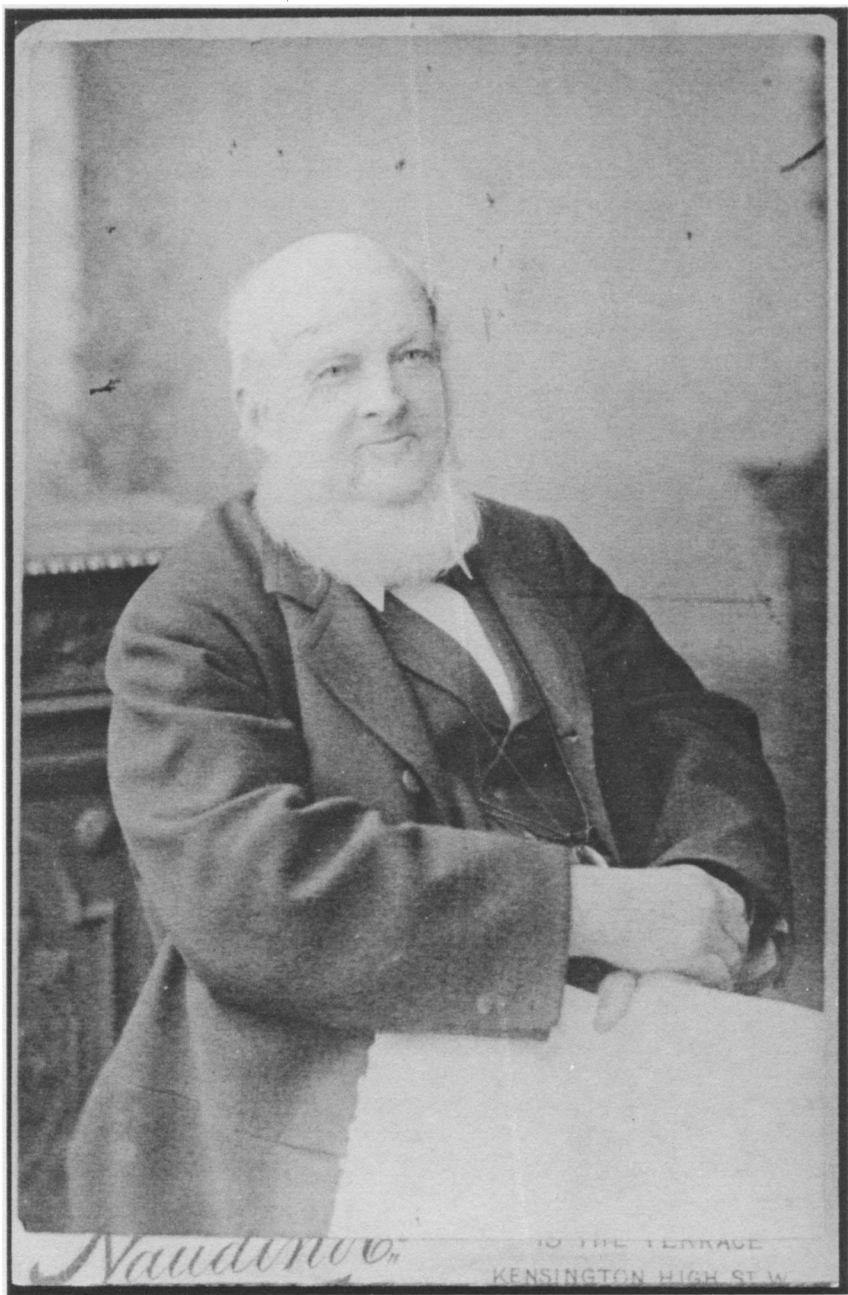
Alexander J. Ellis (1885b:526)

The Founder of Comparative Musicology?

On 25 March 1885, a 71-year-old Englishman named Alexander John Ellis (Figure 1) read a paper "On the Musical Scales of Various Nations" at a meeting in London of the Society of Arts.¹ At the end, Ellis received the Society's silver medal, a distinguished award. With the aid of live demonstrations, Ellis offered detailed statistical data by means of his recently devised cents system, a system which allowed the precise delineation of pitch measurements expressed as hundredths of an equal-tempered semitone. Until Ellis's work, individual pitches and the intervals between them were more typically described by means of frequency measurements like $A = 440$ (vibrations per second). Precise enough for representation of individual pitches, frequency measurements are unsuitable for the study of whole systems because frequency increases from the lowest to the highest tones, doubling with each octave. The researcher cannot describe intervals in general using vibrations per second, since the same interval has a different reading each time it occurs across the whole pitch spectrum. By contrast, the cents system divided the octave into 1,200 cents, 100 for each equal-tempered semitone. Algebraic mathematics was used to factor out the problem of frequency; now any interval was fixed in numerical representation, irrespective of its specific pitch level. Ellis disseminated his new system in a series of articles (1884, 1885a, 1885b).

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Figure 1: Photograph by Naudin and Co. of Ellis in 1886. (Reproduced by permission of the National Portrait Gallery, London.)



Cents were extremely convenient for the kind of comparative study that Ellis essayed. Based on an impressive assemblage of musical instruments and traditions, he pointed to the crucial role of human agency in the construction of scale systems worldwide. Certainly, the Western observer might deem pitch systems from elsewhere around the globe capricious—a word Ellis may deliberately have selected to summon up the image of the sure-footed steps and leaps of the mountain goat, so fitting to their particular environment and so hard for the outsider to predict or imitate—but Ellis had found that pitch systems did not emerge from acoustic principles occurring naturally in the world. Instead, they were artifices fashioned diversely from place to place through direct human intervention and choice.

Ellis's presentation was far distant in content and tone from the experiential ethnographies fashionable in today's ethnomusicology, and as little as twenty years after his death music researchers inspired by folklore and anthropology were beginning to turn to field study as a primary means of gathering data, not pitch analysis. Nevertheless, his paper achieved a genuinely lasting impact. Ellis's conclusion is still cited, prized, and even memorized, by modern-day ethnomusicologists. It was on the strength of this paper that von Hornbostel (1922:3) declared Ellis the "true founder of comparative scientific musicology," an ascription echoed by a succession of writers until the present. Von Hornbostel's choice is striking. There were numerous other candidates for such an appellation, including, perhaps most notably Carl Stumpf (1848–1936), founder of the Berlin Institute of Psychology where von Hornbostel worked. Stumpf had himself written a seminal paper at much the same time as Ellis's analysis of scales, a study of the songs of the Bellacoola Indians of coastal British Columbia, Canada (1886). Stumpf's paper, written after research with musicians visiting Germany, was perhaps the first systematic analysis of a particular musical tradition within the emergent disciplinary framework of comparative musicology. Nevertheless, both von Hornbostel and Stumpf (see Murchison 1930:439) recognized Ellis's contribution as formative.

Yet, if such expert scholars quickly accorded Ellis a foundational role in the creation of comparative musicology, Ellis's research on late-nineteenth century pitch systems was in many senses a striking interruption of his primary work at this time: a quite enormous, five-volume study on the history of English pronunciation. This was a task that had occupied him since the 1860s and in favor of which he had put aside numerous other projects and interests. He was to resume this work immediately after his paper on scales, a point taken up further below. Not for nothing does the *Oxford Dictionary of National Biography* summarize Ellis's career as that of a "phonetician and mathematician" (MacMahon 2004).² And a more rounded view of Ellis's music research paints a portrait of him as an accidental and certainly an unwitting

ancestor for the new discipline. Nevertheless, certain aspects of Ellis's work remain in tune with today's ethnomusicologies of engagement, and there is rather more for us in a reconsideration of the man, his writings, and his intellectual legacy than a simple revision of his role as a historical marker.

Leaning Towers, Early Concertinas, and Wild Horses

Born in 1814 in London, Alexander John Sharpe was offered considerable funds at age 11 by a maternal uncle. On condition that he take up his mother's surname (Ellis), Sharpe would be enabled to engage in a lifetime of study and research without the need to seek paid employment. This bequest provided the foundation for Ellis's later interdisciplinarity, allowing him to follow up on interests and enthusiasms as he wished; even within Ellis's own lifetime, later generations of researchers more typically worked in institutionally funded posts, operating within a narrower band of fields, even if these very same constraints also provided a steady stream of pupils to directly take up and further develop the research.

After an expensive education at Eton and Cambridge—where he studied mathematics and classical languages—Ellis departed for the conventional grand tour of Italy. This tour was formative in several respects. For instance, Ellis began field study, but not yet publication, as a phonetician, noting down Italian dialects in a newly devised form of phonetic transliteration. In this, his prior learning of Latin was of great utility, providing him a vantage point from which to consider questions of dialect change. Field study also gave him a context within which he could energetically develop his interest in the very latest technology and aim to fulfill a valuable social role. Ellis knew that only the wealthy could tour Italy and view the sites and antiquities first-hand. Photographic images published with suitable commentaries, however, could improve the minds of those unable to visit them in person. Devising a plan (for which no publisher could finally be found), Ellis pioneered daguerreo-type photography, and his surviving images include some of the earliest shots of significant architectural and topographical sites, including the very first photograph of the Leaning Tower of Pisa (Figure 2).³

A second technology that fascinated him was Wheatstone's newly invented English concertina, which he learned to play (Ellis 1877:16–17). The concertina was invented in 1829–30, initially for use in Wheatstone's own lectures on musical acoustics, and marketed commercially from the mid-1830s (Wayne 1991:117, 130). Inspired by the Chinese *sheng* (mouth organ), and created with acoustic experimentation in mind, the fully chromatic instrument was a prophetic choice for Ellis, given his later interests in the exploration of global pitch systems. Ellis noted that he “had been familiar with [the instrument] from boyhood, having possessed some of the earliest

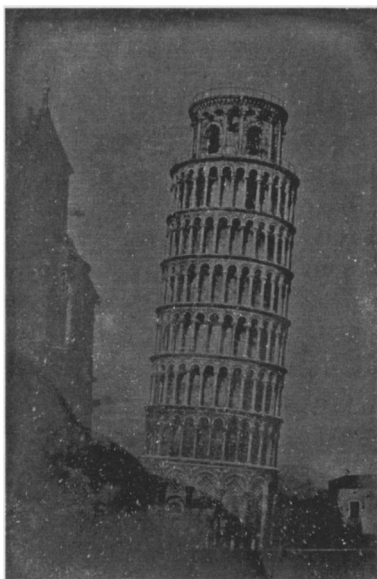


Figure 2: The earliest known daguerreotype of the Leaning Tower of Pisa, taken by Ellis from the grass plot west of the tower, June 25, 1841. (National Museum of Photography Film and Television / Science & Society Picture Library, London.)

concertinas made" (1885b:486). The first of these that I have been able to trace is a concertina purchased by Ellis in 1839, which has survived and is presently in the collection of the Horniman Museum in London (Figure 3).⁴ This is just one detail among many that suggest later accounts of his tone deafness have been exaggerated.⁵

Ellis's record from these formative adult years also reveals him as an avid reader of the latest reports on a wide selection of subjects, a characteristic he retained throughout his life. Ellis had edited a periodical as a schoolboy at Eton (Ellis and Charlton 1833) and had issued a volume of verses (1836) but one of his first mature prose works was a treatise on horse-taming. The account reveals the recently wedded Ellis ("the Communicator") keen to display his credentials as a man of the outdoor world to his brother-in-law's Yorkshire-based circle. Interesting in itself, this item is worth quoting at some

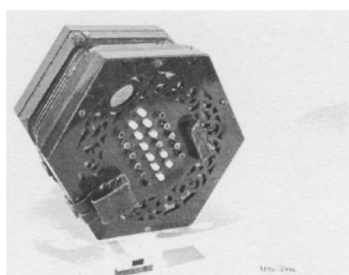


Figure 3: Wheatstone concertina no. 244, as owned and played by Ellis. (Wayne Concertina Collection no: M9a-1996, The Horniman Museum, London.)

length here for three reasons: first, it shows that Ellis knew well how to employ what we might call an ethnographic style quite distinct from that found later in his music-related writings; second, it illustrates his emphasis on the foundational role of empirical experimentation as a basis for theoretical knowledge, an approach fundamental to his research, whether pitch-related or not; and third, it typifies his wish to produce writing that led to a positive social impact:

The object of the following pages is two-fold: first, to extract the account of the North American Indian method of Horse-taming, as given by Mr. Catlin in his new work, entitled *Letters and Notes on the Manners, Customs, and Conditions of the North American Indians*, and to detail certain experiments which have been tried by the direction and in the presence of the Communicator; and second, to urge gentlemen, farmers, stable-keepers, horse-trainers, horse-breakers, and all others who may be interested in taming horses, to try for themselves experiments similar to those here detailed, experiments which are exceedingly easy of trial, and will be found exceedingly important in the result

During a visit in the North Riding of Yorkshire, the volumes of Mr. Catlin first fell under the Communicator's observation, and . . . struck him forcibly. Although he scarcely hesitated to comprehend the circumstances there detailed, under a well-known though much-disputed class of phenomena, he was nevertheless anxious to verify them by actual experiment before he attempted to theorize upon them. And he now prefers to give the naked facts to the public, and leave his readers to account for them after their own fashion. It so happened that, while staying with his brother-in-law, F. M., of M- Park, the Communicator had the pleasure of meeting W. F. W., of B-, a great amateur in all matters relating to horses. In the course of conversation the Communicator mentioned that he had read about horse-taming, and the detail seemed to amuse them, although they evidently discredited the fact. The Communicator begged them to put the matter to the test of experiment, and M., who had in his stables a filly, not yet a year old, who had never been taken out since she had been removed from her dam, in the preceding November, agreed that he would try the experiment upon this filly. The Communicator made a note of the experiments on the very days on which they were tried, and he here gives the substance of what he then wrote down

Friday, February 11, 1842. In the morning W. and M. brought the filly from the stable to the front of M.'s house. The filly was quite wild, and on being first taken out of the stable she bolted, and dragged W., who only held her by a short halter, through a heap of manure. W. changed the halter for a long training halter, which gave him such power over her that he was easily able to bring the little scared thing up to the front of the house. Both M. and W. seemed much amused, and laughingly asked E. (the Communicator) to instruct them in Catlin's method of taming horses. E. did so as well as he could, quoting only from memory. The experiment was not tried very satisfactorily, but rather under disadvantages. The filly was in the open air, many strangers about her, and both the experimenters were seeking rather amusement from the failure than knowledge from the success of their experiment. W. kept hold of the halter, and M., with considerable difficulty, for the filly was very restive and frightened, managed to cover her eyes.

He had been smoking just before, and the smoke must have had some effect on his breath. When he covered her eyes, he blew into the nostrils, but afterwards, at E.'s request, he breathed; and, as he immediately told E., directly that he began to breathe, the filly, who had very much resisted having her eyes covered and had been very restive, "stood perfectly still and trembled." From that time she became very tractable. W. also breathed into her nostrils, and she evidently enjoyed it, and kept putting up her nose to receive the breath. She was exceedingly tractable and well behaved, and very loath to start, however much provoked. The waving of a red handkerchief, and the presenting of a hat to her eyes, while the presenter made a noise inside it, hardly seemed to startle her at all.

Saturday, February 12, 1842. This morning the filly was again led out to show its behaviour, which was so good as to call forth both astonishment and praise. It was exceedingly tractable, and followed W. about with a loose halter. Attempts were made to frighten it. M. put on a long scarlet Italian cap, and E. flapped a large Spanish cloak during a violent wind before its eyes, and any well broken-in horse would have started much more than did this yearling.

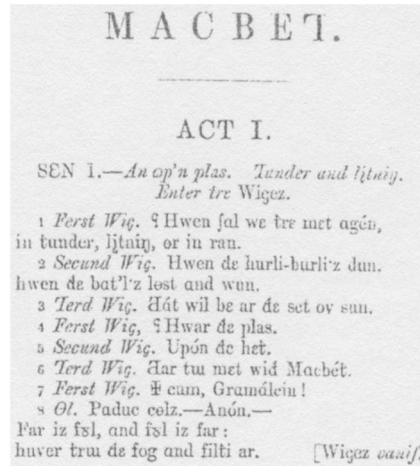
... The process as now presented is one of great humanity to the horse, as well as ease and economy to the horse-owner. The only objections to it are its novelty and simplicity. Those who have strength of mind to act for themselves, and not to despise any means, however simple or apparently childish, will have cause to rejoice over the great results at which they will arrive. But the great watchword which the Communicator would impress upon his readers is, "Experiment!" (Ellis 1842)

Soundly Organized Humanity: Ellis's Phonetics of Social Engagement

Ellis's interests in phonetics and the improvement of human society proved to be longer lasting than that in the gentler breaking of horses. In 1843 he came together with Isaac Pitman (1813–1897), known as the inventor of stenography. Pitman and Ellis determined to apply their knowledge to the problem of working-class illiteracy, and they energetically put forward a series of proposals for a reformed alphabet named phonotypy. Essentially, the pronunciation of letters in the phonotypic alphabet was more consistent than that in standard written English, and therefore reading could be learned more speedily. To demonstrate the virtues of the system and provide materials for daily use, Ellis rewrote extensive Biblical extracts and excerpts from English literature. Figure 4 shows the opening of *Macbeth* from Ellis's edition of 1849, a fitting exemplar for this ultimately doomed attempt to overthrow the reigning orthography. Other works that Ellis reset between 1846 and 1850 were *Paradise Lost*, the *New Testament*, and *Pilgrim's Progress*, all sharing the high literary and moral values he hoped to see disseminated through the project.

Even in the nineteenth century, great literature did not suit every occasion, and so Ellis also issued a journal (*The Phonetic Friend*) in which

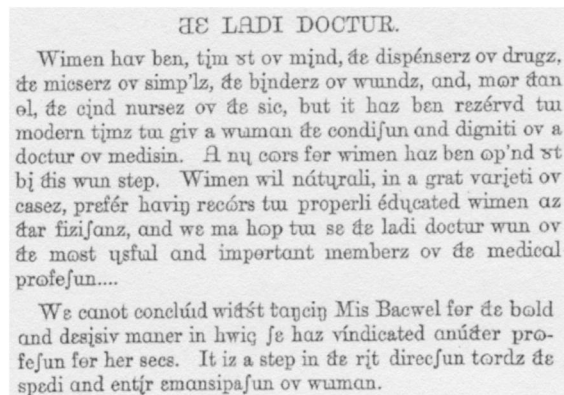
Figure 4: Opening of Ellis's phonotypic edition of *Macbeth*, 1849.



he presented short articles on matters of topical interest intended also to improve the mind and encourage social change. Figure 5 illustrates the issue dated Aug. 1849 to Jan. 1850, with extracts from an essay entitled “The Lady Doctor.” Despite the missing “l” in her name (the “c” here functions as a “ck”), it is clear that Ellis is referring to British-born Elizabeth Blackwell (“Mis Bacwell”; 1821–1910), the first woman to gain a medical degree and practice as a doctor in the US.⁶

Ordinary men and women may or may not have been encouraged by such examples, but Ellis also needed to capture educational markets if he was to gain widespread usage for phonotypy. This he attempted by composing articles arguing for the system, and also by creating nursery rhymes with the hope of exposing children directly to the new means of writing. One of

Figure 5: Extracts from “The Lady Doctor”, *The Phonetic Friend*, Aug. 1849–Jan. 1850.



these rhymes, originally written in phonotypy in the 1840s for Ellis's own children, is reproduced here from a later, standard English edition, where it appears alongside artwork contributed by Ellis's son Edwin, who was then launching a career as an artist:

THE EGG

Little Tom Trot
 An egg had got,
 But had forgotten to boil it.
 He cracked it soon
 With a wooden spoon,
 And so contrived to spoil it.

 He found it no joke
 To eat white and yolk,
 When they hadn't been set by boiling.
 So the next time Tom Trot
 An egg had got,
 He cooked it, to keep it from spoiling! (Ellis 1865:6)

Mr. Ellis was not Dr. Seuss, evidently, and his verse strikes a paternal tone likely to appeal more to the Victorian schoolmaster than the schoolboy. (The former purchased the textbooks, of course.) Still, and notwithstanding the enthusiasm that greeted his phonetic project, the chance of inspiring widespread reform was always low and Ellis applied himself to new projects even as the 1840s wore on. Many of these shared with the phonetic work a hope for the most widespread practical utility. Examples included: a perpetual calendar in 1849; a "digraphic alphabet" for travelers in 1856, which helped them to pronounce foreign words; a manual, *Speech in Song*, that guided singers toward clearer pronunciation in 1877; and in 1882, a logic primer for children.

Other work contributed to the rising academic field of philology. Here, as elsewhere, Ellis corresponded actively with peers across Britain, Europe, and in North America. In May 1868, for instance, he sent a copy of a book by Alexander Melville Bell (1819–1905) to Cambridge-based philologist William Aldis Wright (1831–1914), noting that this would help explain the sounds of words, this gift following on from a letter in which Ellis had commented as follows:

In order to write about pronunciation it is necessary to have some system of writing sounds. I inclose⁷ a copy of my glossotype (which may yet be improved) which I have invented for the purpose of writing provincial glossaries of English (hence its name) in an intelligible yet thoroughly English way. (Ellis 1868)

In return, Ellis asked Wright to help him trace an early song manuscript he believed might be found in a Cambridge library. Rhyming in the lyrics, Ellis hoped, contained clues on the pronunciation of early English, and he

sent pages of word lists in illustration of his discoveries so far. At this same time, Alexander Melville Bell's son, Alexander Graham Bell (1847–1922), subsequently inventor of the telephone, was in touch with Ellis, an encounter with far-reaching consequences, which the younger Bell described in his autobiography written up a decade later:

During the year 1866 I made a musical analysis of all the vowels with which I was acquainted and forwarded the results of my experiments to the distinguished linguist and philologist Mr. Alexander J. Ellis of London. Mr. Ellis in reply, informed me that the experiments I had undertaken had been already performed in Germany by Prof. Helmholtz and that Helmholtz had gone a great deal further than I had for he had not only analyzed vowel sounds into their component musical elements but had actually performed the synthesis of them. Helmholtz, I was informed, by an ingenious arrangement of tuning forks which were kept in continuous vibration by means of an electrical current and a system of resonators, whereby he could regulate the relative intensities of the sounds produced by his tuning forks, he had been enabled to build up artificially the human voice. He had made his tuning forks speak vowel sounds.

Mr. Ellis's communication while in one sense a disappointment, because it showed me that my experiments and my deductions from them had been anticipated by others, though still an incentive to further exertion; for my curiosity was raised to the highest pitch and I desired to know more fully the nature and mode of operation of Helmholtz apparatus in reproducing vowel sounds.

In the year 1867 I took advantage of a visit to London to call upon Mr. Ellis, who spent several hours explaining the theories and experiments of Professor Helmholtz. This interview with Mr. Ellis made a lasting impression upon my mind and from it I date my interest in the subject of the electrical production of sound. I was too imperfectly acquainted with the laws of electricity, to understand fully the operation of Helmholtz apparatus; and I commenced at once to study the subject of electricity for the express purpose of understanding Helmholtz experiments.

Without knowing much about the subject, it seemed to me, that if vowel sounds could be produced by electrical means so could consonants, so could articulate speech. Within a few days of my interview with Mr. Ellis I came to believe firmly in the feasibility of the telegraphic transmission of speech, and I used to tell my friends, that some day or other we should talk by telegraph. (Bell 1879:3–4)

This description of electronically regulated tuning forks as used by Hermann Helmholtz (1821–1894) will be of interest to those wondering how the latest technological innovations contributed to early pitch-related study. Beyond the seeding of new possibilities in Bell's mind, it is notable that Ellis remained interested in the experimental scientific measurement of speech sounds in the present day, even as he worked on the history of English pronunciation. This ability to combine seemingly disparate fields of enquiry was clearly deeply inscribed in Ellis's approach to scholarship more generally.

Alexander Graham Bell was not the only admirer of Ellis's work in pho-

netics. Another prominent devotee was novelist, critic, and dramatist George Bernard Shaw (1856–1950), a fellow campaigner for spelling reform. Shaw's Preface to *Pygmalion* written in 1913 (better known to some in its musical version, *My Fair Lady*) contains Shaw's description of Ellis, whom he took as a partial archetype for the role of Professor Higgins, the Preface itself being given the subheading "A Professor of Phonetics":

The English have no respect for their language, and will not teach their children to speak it. They spell it so abominably that no man can teach himself what it sounds like. It is impossible for an Englishman to open his mouth without making some other Englishman hate or despise him. German and Spanish are accessible to foreigners: English is not accessible even to Englishmen. The reformer England needs today is an energetic phonetic enthusiast: that is why I have made such a one the hero of a popular play. There have been heroes of that kind crying in the wilderness for many years past. When I became interested in the subject towards the end of the eighteen-seventies, Melville Bell was dead; but Alexander J. Ellis was still a living patriarch, with an impressive head always covered by a velvet skull cap, for which he would apologize to public meetings in a very courtly manner. He and Tito Pagliardini, another phonetic veteran, were men whom it was impossible to dislike.⁸

Some of Ellis's other research was less directly intended for mass, everyday use. Writing for specialists, he offered up: a treatise on water in 1862, and simultaneous work on the relationship between height and barometric pressure; a discourse on salvation in 1875; and, in 1884, notes on the language of the Andaman Islanders—all these just examples from a total of some three-hundred published items. Among this energetic flow of scholarly enquiry and output, he was significantly active as a mathematician throughout the middle decades of the century. His most complex offering was *Algebra Identified with Geometry* of 1874. This 84-page tract (available from Messrs C. F. Hodgson and Sons for the not inconsiderable price of 5 shillings) ran from Euclid to ratio and proportion, through Carnot's principle to the laws of tensors, and, by way of the algebra of triangles, into the heady realms of stigmatic geography. In fact, fellow mathematicians generally did not accept Ellis's proposal of a fundamentally geometric basis for algebra. Letters now in Cambridge University Library bear testimony to the dogged persistence Ellis showed in correspondence stretching over a twelve-month period (1872–73). In these letters he argued against apparently negative reports on a draft paper he wished to present in print or orally at a meeting of the Royal Society.⁹ Contemporary researchers will likely recognize at least some affinities with the academic environment today. In fact, Ellis essentially put aside mathematics after *Algebra Identified with Geometry* to devote himself to the study of acoustics of dialect. Nevertheless, the ethnomusicologist who examines this item will note both the breadth of fields that Ellis sought to link together—his inherently interdisciplinary stance—and, at the level of technique, how he

could go on to invent and calculate cents after this work; indeed, doing so represented a considerably more straightforward application of algebra than occurs in his later mathematical writings.

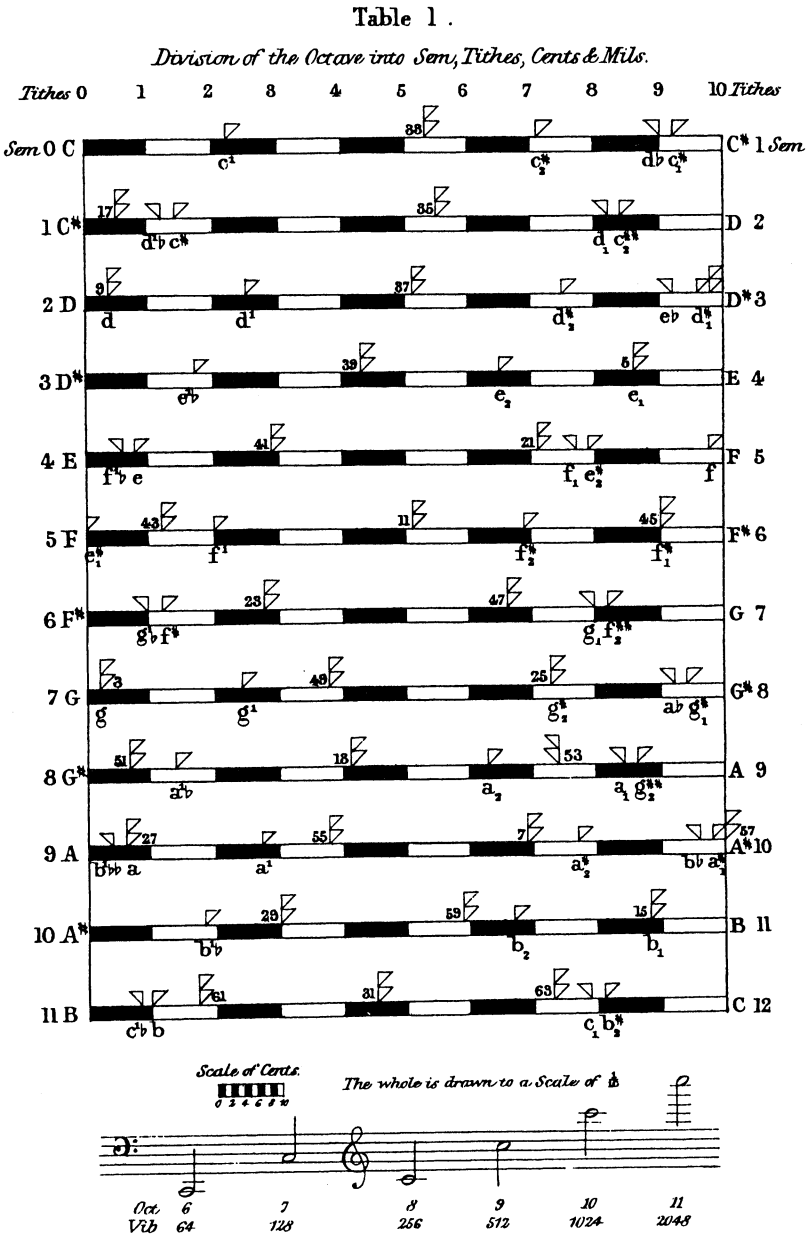
Acoustical Approaches

His technical imagination fired up by this mathematical tour-de-force, Ellis's turn to acoustics and to music was fortuitous, even if he proved to be a productive writer. In his work on dialect Ellis had been striving to better understand vowel sounds. A contact had recommended that he look at some new writing by Helmholtz, which addressed this same problem. As we have just seen, Ellis became seriously interested in this work, and by 1875 he had published a complete translation of Helmholtz's pioneering volume *On the Sensations of Tone as a Physiological Basis for the Theory of Music*, contributing major appendices of his own as well.

Two examples are presented here to sketch out a fuller sense of Ellis's orientation in music research. The first is an article entitled "On the Sensitiveness of the Ear to Pitch and Change of Pitch in Music," initially presented at a meeting of the London Musical Association on 6 November 1876. In this paper Ellis introduced the idea of the cent, which he described as a 1/100th of a tempered semitone, ten of which comprised a *tithe*—so named to avoid confusion with the interval of a tenth. Figure 6, from that paper, shows also the strong impact of geometry: cents are first of all measurements in space on a "monster pianoforte" 480 feet long (Ellis 1876–77:8). He also devised the *mil* (a 1/1,000th of a semitone) and the *dime* (1/10,000th). Cents are invented here not to deal with comparative pitch systems but to measure a listener's sensitivity to divergences from particular pitches, and intervals expressed not in cents but predominantly as ratios. The paper as a whole assessed the sensitivity of the ear to pitch across the whole range of human hearing. Ellis discovered that musically experienced listeners confronted with tones across three octaves from the center of bass stave to the top of the treble stave, typically heard the perfect fifth, the unison, and the octave as in tune with an accuracy of 1–2 cents. Meanwhile, the major tone was considered in tune within a range of 4–5 cents, and most other consonant intervals were accorded a tolerance of 10–18 cents (Ellis 1876–77:17). Ellis proceeded to suggest reasons why the former intervals seemed to be those heard most sensitively by musically active listeners.

A second instance of Ellis's music writing is provided by a short book published in 1877 entitled *On the Basis of Music*. Those of us armed by historical hindsight might see in its title the potential for a late-nineteenth century *How Musical is Man?* Indeed, several passages show Ellis's ability to raise fundamental questions, drawing conclusions that point the present-day ethnomusicological reader forward to Ellis's work on scales:

Figure 6: Table 1 from Ellis (1876–77:24) showing a scale drawing, originally 48 inches wide, for the measurement of semitones (sem) and smaller intervals. (Superimposed triangles are marker points, referred to in Ellis’s text.)



Another friend of mine . . . wrote a book shewing how “to teach a child music.” When I came to examine it, I found it was a plan . . . for teaching a little girl to play on the piano. But is music identical with the piano, even supposing it to be properly played? Surely there was music in the world before it dreamed of pianos . . . I am afraid we are too apt to identify music with the sound to be elicited from the piano.

But how are we to select these tones [which would call our feelings into action and have a good effect when sounded together]? Here there seems at first to be no kind of principle at work, *for different nations have chosen very differently, and our present choice seems to be remarkably strange, and is, at any rate, very modern and extremely artificial*. But a little examination shows that the earliest Chinese and Gaelic, and the later Greek and Arabic, had a decided principle . . . (Ellis 1877:3, 17, emphasis added)

The ethnomusicological reader, reassured that there is more to music than the piano, might be tempted to pause here, recall Ellis’s championing of everyman’s education and of everywoman’s emancipation, think forward to his paper on the musical scales of various nations (1885b), perhaps hum a strain or two of “I Could Have Danced All Night,” and conclude that Ellis would move smoothly on to found a globally aware kind of musicology. But to do so is to construct quite the wrong impression of Ellis’s intentions and vector in music research. In fact, *On the Basis of Music* contains little mention of other musics; despite the passages quoted above it is primarily a suggestion, after Helmholtz, that the art of music emerges directly from the hard science of physical acoustics, a proposal Ellis would go on to refute in the 1880s.

His reconsideration of this notion occurred only gradually. Instead, Ellis’s very next step was to produce a history of musical pitch, using Western sources only (1880). As in the listening-based research, Ellis applied his own great watchword of the 1842 horse-taming experiences—“experiment!”—measuring with a commissioned set of precision-made pitch forks the empirical data offered up by surviving organs, antique tuning forks, and elderly pianos. Collaborating energetically with Alfred Hipkins (1826–1903) from October 1876 on, he corresponded widely to gather as complete a body of data as possible.¹⁰

Only having assessed thousands of European sources, did Ellis then move to look more carefully at those with more distant origins, whether in written form or accessed through instrument collections and touring performances at international fairs and exhibitions (1884, 1885b). Ellis’s approach remained that of the experimenter, as illustrated in the following series of extracts from his letters to Alfred Hipkins:

I also send you the best I can do with the Hindu Scale. I think that I am probably right. The scale C’ D’ E’ F’ G’ A’ B’ C’ [C’] is easily tuned by taking frets at definite lengths of the string. The intervening sutri’s [*srutis*] are I strongly suspect

obtained by dividing the *distances* between these frets into 4, 3 or 2 parts as the case may be, because Arabs play the same trick, the division is simple, the division to give equal intervals complex, while the difference will be minute. (1882a:338, Ellis's emphasis)

But to determine the Vina scale as accurately as the frets alone will give it I must get hold of a vina myself & measure the lengths upon it in millimeters. There must surely be one in London . . . Perhaps there may be some Indian in London who possesses one & can play it. He would be a catch. (ibid.:339)

I found there's a fretted Vina at the S. Kens.ⁿ Mus. [South Kensington Museum—now the British Museum] & I am going to measure the distance of the frets to morrow. I shall then be able to give a real account of its scales. (1882b:341)

I was at the S. Kens.ⁿ Mus.^m this morning in spite of the fog. I met Mr Phookan. We looked at some of the instruments & I found I had made a mistake in measuring the length of string for both Vinas & that as movable frets can't be trusted my T'ar of Cashmere is of no use. [Ellis goes on to note that the particular string-stopping technique used "causes however much difficulty in determining the scales".] (1882c:344)

If Ellis was admirably ready to be corrected by Phookan and to drop a line of theoretical enquiry that practice did not support, it is equally clear that Ellis was trying hard to understand what he, and many of his peers, saw as the science of music, not to science about musics. The same experimental approach to instruments and musicians as sources of acoustic data remained operative two years later as he assembled material for his final paper on scales:

Mr. Hipkins and I were enabled to "interview" the musicians on four mornings in July and August, 1884, for two hours at a time, with the help of an interpreter, in the large dining-room of the Chinese contingent of thirty-one natives . . . We were thus enabled to get the musicians to play us the scales of their instruments and take the pitch of their individual notes by means of my forks. (Ellis 1885b:515)

When the opportunity presented itself, Ellis, anticipating Simha Arom in Central Africa a century later, played back on a specially designed instrument the scale he had derived from careful measurement of a foreign xylophone, asking expert musicians for their feedback. In fact, the Thai musicians with whom Ellis worked in that experiment reported that his reproduction of the scale sounded out of tune, an observation that led him to assume the instrument he had measured had fallen out of pitch during its long, inter-continental voyage (Ellis 1885c:1105). If this particular exercise led to no new specifics on Thai scales, Ellis's attitude is striking at a time when many in elite European circles assumed the conventions of classical music such as the equal-tempered system to be highpoints of human development that lay beyond the reach of those of other nations or social classes, and treated any difference from these standards as signifying a falling short of perception,

replication, or both. Contacts like this led Ellis to a sophisticated observation for that time, namely that, “there is no practical way of arriving at the real pitch of a musical scale, when it cannot be heard as played by a native musician; and even in the latter case, we only obtain that particular musician’s tuning of the scale, not the theory on which it was founded” (Ellis 1885b:490–91). Insider views were essential in both producing and checking data, then, but the researcher still needed to triangulate the results of measurement to existing theoretical sources.

Yet, and if Ellis was capable of a thoughtful response to such a research situation, it is also true that some of his claims at this time seem methodologically less assured by today’s standards:

It may be added, although it cannot appear from the table of the scales, that in listening to native Javese, Chinese, and Japanese performers, there seemed to be a total absence of what we term expression. There was no piano and forte, no shading or *nuance*, merely a hard playing of the notes. (Ellis 1885a:527, emphasis in original)

Many of us, repeatedly sounding scales for experimenters with a battery of tuning forks (remembering that Ellis liked each tone held for twenty seconds while he counted the beats), might also find ourselves playing rather inexpressively. If nothing else, the passage underlines the point that Ellis’s greatest interest (and best insights) lay essentially in the investigation of non-Western pitch, not musical repertoires or performances. We sometimes have a notion of Ellis as a Victorian proto-ethnomusicologist actively devising a method of measuring pitch *in order* to inspire a new field of study dedicated to all the world’s musics. This was an end-point Ellis’s work allowed, certainly, but it never appears to have been a target he set himself nor one he recognized after the event. Indeed, just a year later when Ellis received a pitch-related paper from prominent Scots physicist, Lord Kelvin (1824–1907), he responded only as follows: “I beg to acknowledge with many thanks your valuable paper on the beats of Imperfect Harmonics which I hope to read with profit. Just now I am head & ears immersed in totally different work, & am unable to attend to music for a while” (Ellis 1886:1). Four years later, at his death in 1890, Ellis had still not returned to music research; that the work on dialect was more important to him is clear enough.

Conclusions

Ellis is from certain perspectives an unlikely ancestor for us today. Though a practical experimenter, he did not take the stance of a participant in the musics he examined, and his writings reveal little about the music in which he did actively participate. He almost entirely avoided discussion of musical compositions, performances, or values, focusing his music-related

writings on the history of pitch, a topic he had approached initially with a philologist's interest in the forming of vowel sounds and then developed with a psychologist's attention to perception. His results were shared not in what we would today call ethnographic writing—as we have seen, he knew how to employ a range of different writing styles, from verse to the essay and to mathematical formulae. Instead, he chose the incremental presentation of experimental data from musical systems treated primarily as schemes of pitched sound. A veteran of the grand tour, he had personally experienced the special insights that arose from extended, onsite field study, but his close focus on pitch measurement gave little scope for the use of such an approach in his studies of musical systems. Never a teacher, Ellis's private wealth allowed his interests to range unfettered across a wide realm of scientific enquiry, adding and dropping topics throughout his career almost as his fancy dictated, this at a time of increasing disciplinary specialization. Ethnomusicology itself, of course, emerged as much in reaction to comparative musicology as a re-named continuation of that particular cluster of disciplinary emphases and approaches, and while the cent remains a convenient tool for the description of pitch, few researchers now treat pitch measurement as a primary field in which to develop larger-scale theories.

From another angle, however, Ellis clearly espoused values which many of today's ethnomusicologists share. He was an energetic seeker of data in the real world, one sensitive enough to notice when actual experience questioned received opinion. "Truth is man's maturest thought," he wrote in a public sermon that was a muscular mix of philosophy, religion, linguistics, and mathematical theory (1875:34), and there is a clear sense in which all Ellis's work represented a seeking out and sharing of truths. He recognized the benefits of multidisciplinary, molding techniques from one field of learning to solve problems encountered in others. He networked energetically with fellow researchers in numerous fields of enquiry, asking questions, answering queries, sharing material, inspiring colleagues, and reviewing the work of his peers (for example, Ellis 1873). A spirited communicator who well recognized the transformative power of words, he was also a pioneer in the use of new technologies and emergent media, notably photographic images. An advocate for the improvement of the lot of the lady doctor, the ordinary horse, and the common man, Ellis respected individual difference. He himself preferred shoes three sizes too large, kept on his velvet cap indoors, and went nowhere without his favorite raincoat, Dreadnought, into which some two dozen pockets were sewn, each containing a handy tool, item, or device (MacMahon 2004). This personal angle and its concomitant tendency toward socially directed action surfaced less in his music-related writings than in his work on language-reform and phonetics, but Ellis's discovery that musical scales were not acoustic givens but humanly organized preferences opened

the ground for the question that remains central to ethnomusicology today: why do people choose to make music in the ways they do?

Ultimately, Ellis does not seem to have been aware of the significance for music research of this discovery, but his sure-footed empiricism, his diverse methodological and technological ingenuity, and his ability to hear what the data (or the musicians) were really saying—even when doing so required an apparently capricious leap of the imagination or the abandoning of an experimental process—all these are qualities that can inspire us still. Above all, his wish to effect positive social change through research and writing continues to recommend him to us. Pointing so richly to the interrelationship of scholarly activity and human values, Alexander Ellis is rather more than simply a disciplinary predecessor; he remains a fine model for our outlook today.

Notes

1. This article began as a paper read at the 50th meeting of the Society for Ethnomusicology in Atlanta, November 2005. Subsequent versions were presented at the School of Oriental and African Studies, London, and at Nanhua University, Taiwan; I am grateful to those who attended for their questions and comments, which led to a number of improvements in the written version. Feedback on drafts from this journal's readers, from several colleagues here in Sheffield, and from Bennett Zon at the University of Durham is much appreciated. I also acknowledge the kind assistance of staff at the several institutions credited with regard to sourcing letters and copies of illustrative matter.

2. Several sources describe Ellis as a "physicist," among them Rhodes (1956:2) and several by Blacking. Ellis does not appear to have been active in that field exactly, although acoustical research is often placed in such a category. Biographical information throughout this article is drawn primarily from McMahon 2004.

3. Lower resolution examples of Ellis's early images are available online at the National Museum of Science and Industry; www.nmpft.org.uk/insight/onexhib_dagtypeitaly_3893.asp (10 Nov. 2005).

4. The Wheatstone ledgers, now available online at the Horniman Museum, London, record sale of instrument no. 244 to A. J. Ellis, Esq., on 1 November 1838; www.horniman.info/WNC-MARC/C104A/PAGES/C1P0130S.HTM (2 Jan. 2006). A second instrument (no. 1320, also in the Horniman Museum) was purchased by Ellis in September 1847; according to the museum's catalogue, a bellows paper on this instrument is marked "Just," presumably in reference to its temperament.

5. The initial written ascription of Ellis's tone-deafness comes from Edith J. Hipkins (n.d.:38), daughter of Ellis's collaborator Alfred J. Hipkins: "Dr Ellis was 'tone-deaf' and could not distinguish between 'God Save the Queen' or 'Rule Britannia'! Happily my father had an unusually sensitive ear and as Dr Ellis arrived at conclusions entirely by calculations, he would call upon his 'other self' in time of trouble with 'lend me your ears'!" Against Edith Hipkins's account, however, we should note that Ellis himself regularly mentions making pitch-related distinctions (for instance, preferring just intonation to equal temperament). Ellis does indeed argue for mechanical measurement, but he does so cautioning that the musically habituated listener too easily hears what he or she expects to hear.

6. Figure 5 reads: "The Lady Doctor. Women have been, time out of mind, the dispensers of drugs, the mixers of simples, the binders of wounds, and, more than all, the kind nurse of the sick, but it has been reserved to modern times to give a woman the condition and dignity of a doctor of medicine. A new course for women has been opened out by this one step. Women

will naturally, in a great variety of cases, prefer having recourse to properly educated women as their physicians and we may hope to see the lady doctor one of the most useful and important members of the medical profession . . . We cannot conclude without thanking Miss Bakewell [Blackwell] for the bold and decisive manner in which she has vindicated another profession for her sex. It is a step in the right direction towards the speedy and entire emancipation of woman."

7. Quotations from Ellis's publications and letters retain their nineteenth-century British spellings and formatting without, in most cases, further editorial comment.

8. Shaw is incorrect in stating that (Alexander) Melville Bell had died by the 1870s; he had merely moved to Canada.

9. These letters form part of Cambridge University Library Additional Manuscript (Stokes Collection) 7656; see RS884, RS892, RS912, RS938, RS947, and RS965.

10. Ellis wrote to Hipkins on 31 October 1876: "Dear Sir, I am very pleased to have your quotations of pitches of various tuning forks. I shall be at the South End of Room Q of the Loan Exhibition of Scientific Instruments, to-morrow (Wednesday) & also on Thursday from 11 to 3 for the purposes of trying forks & making experiments with Appunn's Tonometer . . . I should be very glad to meet you. [Ellis explains how he works out pitch differences by counting beats between two pitches over a period of 20 seconds.] If you come you will know me alone by my bald head, white beard and stout figure" (Ellis 1876:123–24).

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