numbering by 2 units, thus reducing the highest observed $G''(v)$ value to $G''(26)=5115\ \text{cm}^{-1}$. It includes, in the region λ3454–3237A, all of the 37 fluorescence bands observed by Elliott as well as nearly 90 additional emission bands obtained by Venkateswarlu, with the exception of eight presumably rather weak bands none of which were observed in fluorescence or absorption. Below λ3237A, however, more and more bands appear which do not fit into our Deslandres table, and are assumed to belong to another system.

The vibrational analysis of system $C\rightarrow X$, given by Venkateswarlu[6] using Rank's formula I, need not undergo a very significant change to be brought in accord with Rank's formula II. We should like, however, to emphasize the fact mentioned by Elliott[4] that this small system centered at λ2767A (together with two other diffuse bands at 2829 and 2878A) can be excited with active nitrogen but not in fluorescence with light of λ1854A. The most likely explanation[8] of this fact is that the upper state lies higher than 54,000 cm^{-1} and combines with a state lying above the ground state, for instance with the term $B^3\Pi_{0u}{}^+$. For this reason no constants for state C were included in the table.

A detailed paper containing the observed data of the systems $F\rightarrow X$ and $E\rightarrow B$ will appear later in the *Helvetica Physica Acta.*

* Now at the Department of Physics, University of California, Berkeley, California.
[1] D. H. Rank and W. M. Baldwin, J. Chem. Phys. **19**, 1210 (1951).
[2] D. H. Rank, J. Opt. Soc. Am. **36**, 239 (1946).
[3] This designation is the one used by G. Herzberg, *Spectra of Diatomic Molecules* (D. Van Nostrand Company, Inc., New York, 1950), p. 541, and differs from the one used by Venkateswarlu.
[4] A. Elliott, Proc. Roy. Soc. (London) **A174**, 273 (1940).
[5] J. Waser and K. Wieland, Nature **160**, 643 (1947).
[6] P. Venkateswarlu, Phys. Rev. **81**, 821 (1951).
[7] E. Skorko, Nature **131**, 366 (1933) and Acta Phys. Polon. **3**, 191 (1934).
[8] It is difficult to check this suggestion from the data published by Venkateswarlu without having a reproduction of the spectrum showing the intensity distribution of the bands.

The Radioactive Decay of Hg^{197} and Hg^{203}†

J. M. CORK, D. W. MARTIN, J. M. LEBLANC, AND C. E. BRANYAN
Department of Physics, University of Michigan, Ann Arbor, Michigan
(Received November 8, 1951)

On bombarding gold with protons or deuterons a radioactive isotope of mercury-197 had been found[1,2] which decayed showing half-lives of about 25 hr and 65 hr. It had been assumed that 'K'-electron capture occurred in each activity, with no isomeric transition in mercury. All of the observed gamma-emissions were supposed to follow in the resulting gold nuclei. Gamma-energies of 77, 135, 165, and 273 kev were reported. An excited level in gold-197 with a half-life of 7.5 sec, first found by Wiedenbeck by gamma-excitation, was again observed in the mercury decay. Coincidence experiments had shown[3,4] the 135 and 165-kev gammas to be in cascade with a positive angular correlation existing between them.

It is now possible by spectrometric studies of sources irradiated in the Argonne heavy-water reactor to express more exactly the energies of the gamma-rays and to show the presence of one gamma-ray not previously observed. Moreover, the conversion electrons of two strong gamma-rays, 134.3 and 165.4 kev, are found to satisfy the work functions characteristic of mercury rather than of gold as had been reported, and are hence associated with an isomeric transition before K-capture. A continued sequence of spectrograms was taken to show precisely which electron conversion lines died out with a half-life of 25 hours and which persisted with a longer half-life. Only those electron lines associated with the 134.3- and the 165.4-kev gammas decayed with the 25-hr half-life. The energies of the electron lines, together with their interpretations, are shown collectively in Table I. Arbitrary numbers in the order of increasing energy are assigned to the gamma rays and shown as superscripts in column 2.

TABLE I. Conversion electron energies and their interpretation.

Electron energy (kev)	Interpretation	Energy sum (kev)	Gamma energy (kev)	Ratio K/L
50.9	K^2(Hg)	134.1	···	···
52.0	$A(\alpha_2-L_I)$	66.9	66.9	···
54.1	$A(\alpha_1-L_I)$	68.7	···	···
56.5	$A(\alpha_1-L_{III})$	68.7	68.7	···
63.3	$L_I{}^1$(Au)	77.6	···	···
63.9	$L_{II}{}^1$(Au)	77.6	···	···
65.6	$L_{III}{}^1$(Au)	77.5	···	···
74.2	M^1(Au)	77.6	···	···
76.8	N^1(Au)	77.6	77.6	$L_I/M=4$
82.3	K^3(Hg)	165.4	···	···
110.8	K^4(Au)	191.5	···	···
119.7	$L_{I,II}{}^2$(Hg)	134.5	···	···
122.0	$L_{III}{}^2$(Hg)	134.3	···	···
131.2	M^2(Hg)	134.9	···	···
133.2	N^2(Hg)	134.0	134.3	<0.1
150.6	$L_{I,II}{}^3$(Hg)	165.4	···	···
152.7	$L_{III}{}^3$(Hg)	165.3	···	···
161.6	M^3(Hg)	165.5	···	···
164.2	N^3(Hg)	165.0	165.4	~0.25
177.1	$L_I{}^4$(Au)	191.2	191.4	~9
194.0	K^5(Tl)	279.5	···	···
264.2	$L_I{}^5$(Tl)	279.5	···	···
275.6	M_I(Tl)	279.3	279.5	~10

Mercury-203 was also produced in the reactor from an enriched (97.3 percent) isotope of mercury-202. On following its decay over several octaves a half-life of 47.9±0.2 days is observed. A single gamma is emitted whose energy is found to be 279.5 kev. This activity was always present in the shorter-lived mercury specimens. Its strong electron lines in thallium are so situated as to almost exactly mask any weaker conversion lines because of a transition in gold of 273 kev, had such electron lines been present in the 25-hour activity as reported by Huber *et al.*

A half-life of 66.4 hours is found for the intermediate period, from observations extending over a month, with corrections for the presence of the 47.9-day activity. No attempt was made to check the reported half-life of 25 hr.

A proposed level scheme is shown in Fig. 1. The order of the 134.3–165.4 kev sequence is proposed from their relative K/L ratios. Deutsch had observed a delay of 1×10^{-8} sec in a coincidence study of the conversion electrons for the two gammas. The electron lines associated with the 77.6-kev gamma-ray are very strong both by conversion and photoelectrically in lead. The K series α_1, α_2 x-ray lines of gold are fairly strong as shown by

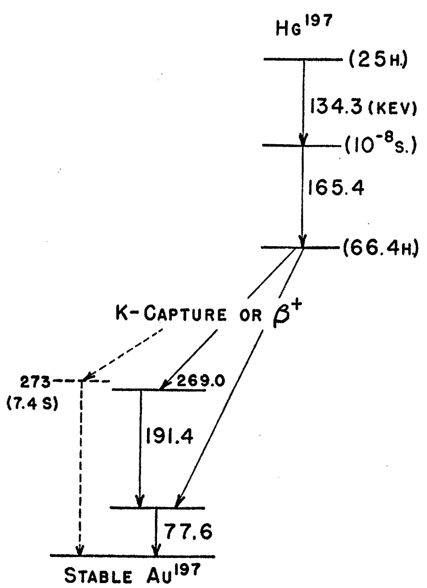

FIG. 1. Proposed nuclear level scheme.

Auger lines and by photoelectrons from a lead radiator. The reported 273-kev transition with its 7.5-sec half-life, although not observed, is included with dotted lines as shown. It could be that this gamma-ray is identical with the 269-kev transition allowed in the level scheme.

Note added in proof.—A more recent paper[5] has just come to our attention in which the authors have arrived at conclusions similar to those here expressed.

† This investigation was made possible by the joint support of the AEC and ONR.

[1] G. Friedlander and C. Wu, Phys. Rev. **60**, 747 (1941); **63**, 227 (1943).
[2] Frauenfelder, Gugelot, Huber, Medicus, Preiswerk, Scherrer, and Steffen, Helv. Phys. Acta **20**, 238 (1947); Huber, Steffen, and Humbel, Helv. Phys. Acta **21**, 192 (1948).
[3] Frauenfelder, Walter, and Zünti, Phys. Rev. **77**, 557 (1950).
[4] M. Deutsch and W. Wright, Phys. Rev. **77**, 139 (1950); F. McGowan, Phys. Rev. **77**, 138 (1950).
[5] Huber, Humbel, Schneider, de Shalit, and Zünti, Helv. Phys. Acta **24**, 127 (1951).